MONITORING OF DOWNSTREAM SALMON AND STEELHEAD AT FEDERAL HYDROELECTRIC FACILITIES - 1996

ANNUAL REPORT

Prepared by:

Rick D. Martinson
Ritchie J. Graves
Robert B. Mills
Jeffrey W. Kamps

Environmental and Technical Services Division
Northwest Region
National Oceanic and Atmospheric Administration
Portland, OR 97232

Prepared for:

U. S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-362 1

Project Number 84-O 14
Contract Numbers DE-AI79-85BP20733

August 1997

TABLE OF CONTENTS

LIST OF TEXT FIGURES

LIST OF TEXT TABLES

INTRODUCTION

The seaward migration of juvenile salmonids was monitored by the National Marine Fisheries Service (NMFS) at Bonneville and John Day Dams on the Columbia River in 1996 (river mile 145 and 216, respectively, Figure 1). The NMFS Smolt Monitoring Project is part of a larger Smolt Monitoring Program (SMP) coordinated by the Fish Passage Center (FPC) for the .Columbia Basin Fish and Wildlife Authority. This program is carried out under the auspices of the Northwest Power Planning Council's Fish and Wildlife Program and is funded by the Bonneville Power Administration.

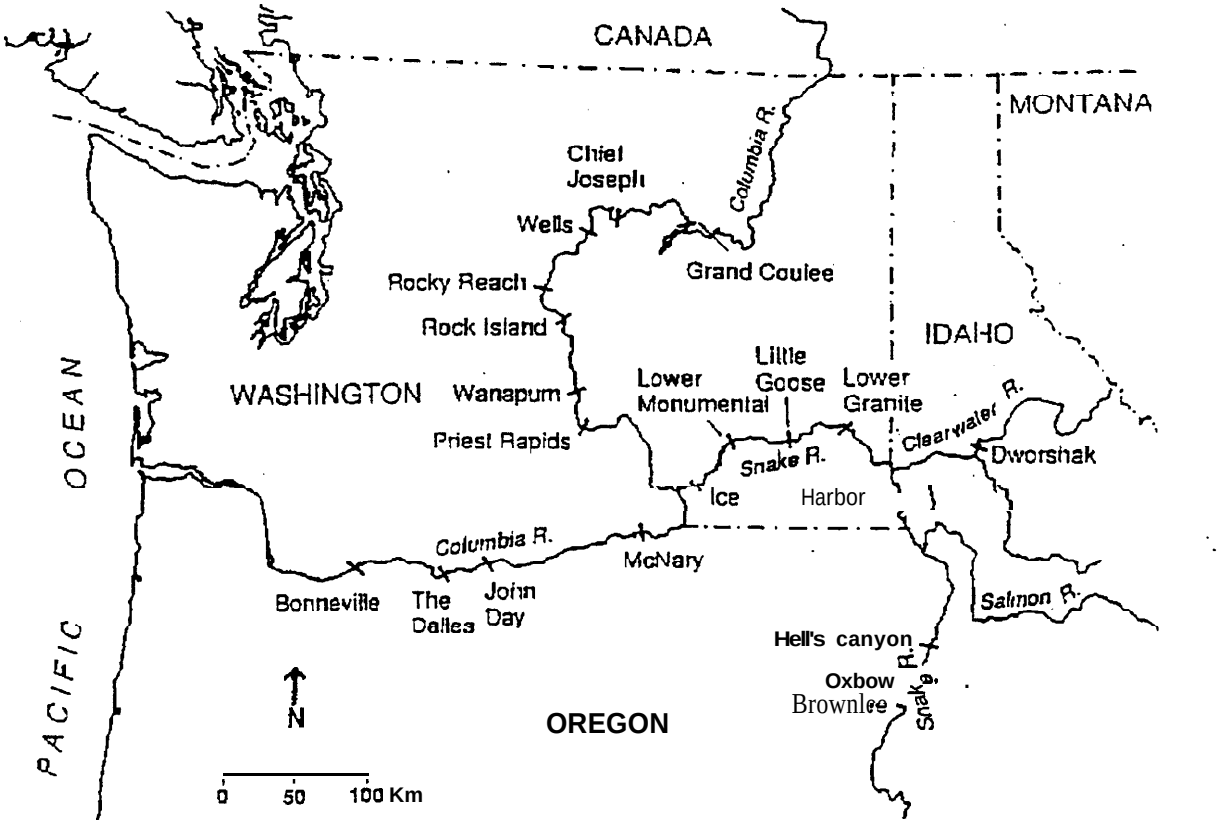


Figure 1. Hydroelectric Projects on the Snake and Columbia Rivers, including the two smolt monitoring sites operated by the National Marine Fisheries Service, Bonneville and John Day Dams. This figure is reprinted courtesy of NMFS-Northwest Fisheries Science Center-Graphics Department.

The purpose of the SMP is to monitor the migration of the juvenile salmonid stocks in the Columbia basin and make flow and spill recommendations designed to facilitate fish passage. Data are also used for travel time, migration timing, and relative run size analysis. The purpose of the NMFS portion of the program is to provide the FPC with species and project specific real time data from John Day and Bonneville Dams.

METHODS AND MATERIALS

JOHN DAY DAM

Fish were collected with an airlift pump system of the type described by Brege et al. (1990), and shown in Figure 2. Collected fish were examined hourly, or every other hour when numbers were low, each 24 hour sample day (0700 to 0700 hours), seven days per week. Fish were collected in a 1,688 liter (450 gal) tank suspended at water level in the gatewell. Each hour, this collection tank was raised and fish were gravity fed to holding tanks in a fish handling building via a 6 inch PVC pipe.

Approximately 50 fish at a time were then crowded into a 21 inch square preanesthetizing chamber (PA). The water level in the PA chamber was lowered to about 5 inches (34 liters) and fish were anesthetized with MS-222 at a concentration of about 44 mg/L. Once anesthetized, fish were net-transferred to the examination trough which contains about 38 mg/L of MS-222 to minimize stress during examination. Fish were routed through a PIT tag detector, then held in a recovery tank before being returned to the bypass system. All fish holding tanks have a constant exchange of river water. Diagrams showing the location of equipment on the deck and the layout of the fish shack are presented in Figure A-l.

Subsampling

This year, as in 1995, subsampling was utilized to reduce the number of fish handled during peak passage periods. Contrary to 1995, once the sample rate was set for the day, it remained unchanged. This was done to make data analysis easier and to minimize the discrepancy between hourly and daily indices. The methodology consisted ot breakmg the sample day into 2 hour blocks, starting at 0700, and sampling for the first 60, 40 or 30 minutes for 50%, 33%, or 25% sample rates, respectively. Sample collection began when the air was *shut off* at the beginning of each two hour block. The basket was raised, emptied and reset, which took about 10 minutes. The sample was collected for the amount of time left, according to the sample rate. Sample fish were routed to the fish shack as described earlier. After examination the sample fish numbers were evenly split between the two hours of that sample block. Fish to be bypassed were first drained into a buffer tank, then drained through a 4 inch flex hose, fitted with a PIT tag detector, back to the bypass channel.

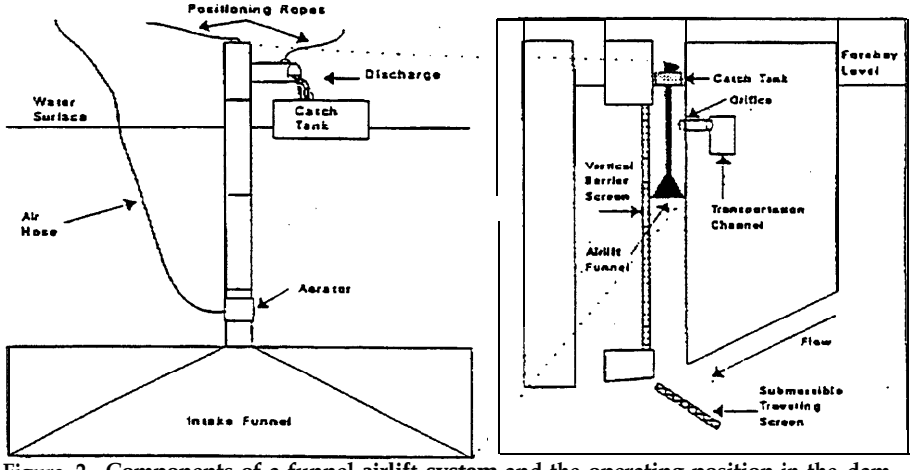


Figure 2. Components of a funnel airlift system and the operating position in the dam.

3C Sampling

Fish for additional PIT tag detections were collected from gatewell 3C using an airlift pump system similar to the one operated in gatewell 3B. Samples were collected'every 1 to 2 hours and processed like the bypassed fish from 3B, that is, drained into a buffer tank, then released through a 4 inch flex hose fitted with a PIT tag detector before being released into the bypass channel. Approximately every 3 days, fish were routed to the fish shack and examined for condition.

BONNEVILLE DAM

Fish samples were collected in the bypass channels of the first and second powerhouses (PHl & PH2) using the downstream migrant traps (DSMl & DSM2) at Bonnevil le Dam. The DSM trap operation is described by Gessel (1986) for the frost powerhouse, and by McConnell and Muir (1982) and Krcma et al. (1984) for the second powerhouse.

First Powerhouse

Sampling in PHl was reduced to 8 hours per **day in** 1996. Samples were collected by lowering a wedge wire flume into the bypass channel at the end of the inclined screen, thus diverting fish into a collection tank suspended at the end of the bypass channel (Figure 3).

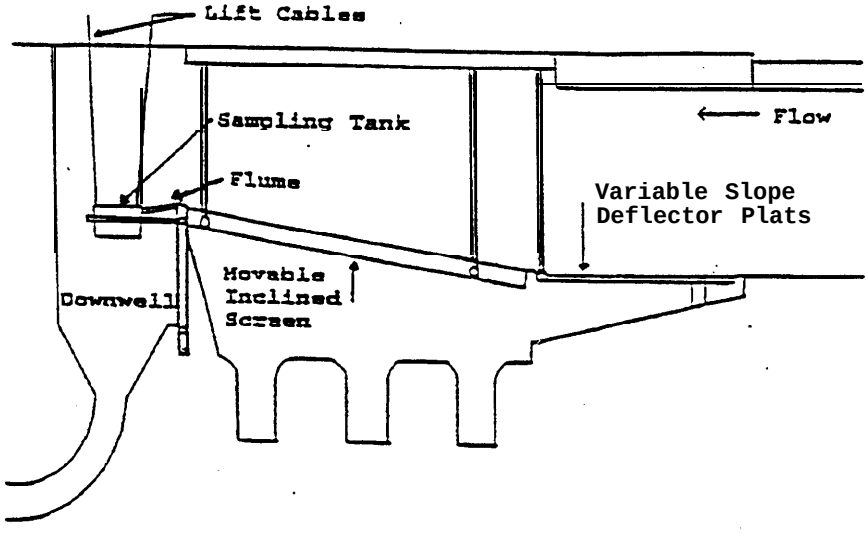


Figure 3. Inclined screen sampling system in the bypass channel of the first powerhouse at Bonneville Dam.

Samples were collected hourly, from 1600 to 2400 hours, seven days per week. The sample rate was adjusted on a daily basis depending on smolt numbers, and normally ranged from 6 to 12 minutes per hour (10 - 20%). During periods of high smolt passage, the sample rate was adjusted on an hourly **basis,** to a minimum of one minute per hour, to avoid overcrowding the trap. Sample time was split into two samples of equal duration per hour, unless the sample rate was set at one minute per hour, in which case a single sample was taken. Fish were net transferred from the holding tank to the sorting trough which contained about 42 mg/l of Finquel (MS-222) to anesthetize the fish. After processing sampled fish passed through a tunnel PIT tag detector/diverter system before emptying into the recovery tank. PIT tagged fish were diverted to a separate tank so condition data could be collected. **A** diagram of the PHl sampling area is presented in Figure B-l.

In 1996, a flat plate PIT tag detection system was added to the top of the sample collection tank. The system consisted of two antennae loops, each housed in a frame enclosed, watertight case. The frame was mounted on top of the collection tank and attached with a pivoting arm in each comer. A pneumatic cylinder was used to raise or lower the flatplate system. Between samples the flat plate was lowered onto the tank and the tank was lowered to sampling position. When the flume was lowered, fish passing over the flatplate were scanned for **PIT** tags. For sample collection, the flatplate was raised and fish were diverted into the collection tank.

Second Powerhouse

The DSM2 was operated up to 24 hours per day, three days **per** week (M, W, F), to obtain a representative sample for monitoring fish condition. Fish collected with the 10% sampling flume were routed to and held in raceways until they were examined. Fish were net-transferred directly from the holding tanks to the sorting trough, which contained about 42 mg/L of Finquel (MS-222) to anesthetize the fish. After examination, fish were placed in recovery tanks and eventually routed back to the bypass channel. A diagram of the PH2 sampling area is presented in Figure B- 1.

Gas Bubble Disease Subsampling

At John Day and Bonneville, naked eye examinations for gas bubble disease symptoms were conducted on sockeye, coho, and the least abundant age class of chinook. Additionally, 200 fish were examined every other day with a dissecting microscope for signs of gas bubble disease. For details on those results see the Fish Passage Center Annual report.

Performance Monitoring

At John Day and Bonneville, as part of our performance monitoring program, coworkers periodically compare results from the same batch of fish, processed independently, and discrepancies are discussed. This approach has several advantages over previously used methods, including: 1) less handling of fish, 2) does not require a supervisor to administer, 3) increased frequency, 4) promotes teamwork and builds consistency between coworkers.

Data Collected

Items l-5 were reported to the Fish Passage Center daily; item 6, the PIT tag data, was reported to the PTAGIS data center daily or weekly, depending on the type of PIT tag data, as indicated below:

1) species specific hourly and daily sample totals
2) brands and fin clips
3) descaling and mortality
4) species specific length and condition data (subsampling only)
5) river, powerhouse, turbine, and spill flow data
6) PIT tag detection (daily) and recapture condition data; length, weight, condition (weekly)

DEFINITION OF TERMS

Three types of numbers are discussed in the report, defined as follows:

1) Total Sample: actual fish counts, number of fish handled.

2) Estimated Collection: total sample number divided by sample rate, resulting in estimated number of fish passing through sample unit.

3) Estimated Passage Indices: estimated collection counts divided by the proportion of flow passing through the sampled system resulting in a relative indicator of fish abundance with no adjustment for Fish Guidance Efficiency, horizontal, vertical or temporal fish distribution.

As stated in the Fish Passage Center Annual Reports, Fish Passage Indices (FPI) are used as relative indicators of population abundance, and assumes that fish pass through spill and powerhouse units in numbers proportional to the flow through those passage routes. Indices are not estimates of total daily passage, but rather a relative measure of , how the migration is progressing over the season for a given species.

John Day and Bonneville generate hourly and daily indices, defined as follows:

Hourly Resolution FPI divides hourly collection counts by the proportion of river flow through the sampled unit or powerhouse for that hour, then sums hourly subtotals to get the daily total. There is no expansion for 8 hour monitoring at Bonneville.

Daily Resolution FPI divides daily collection counts by the proportion of daily average river flow through the sampled unit or powerhouse for the day.

RESULTS AND DISCUSSIONS

JOHN DAY DAM

River Conditions

River Flow

River flows in 1996 were the highest in recent history. The 1996 spring (April & May) river flow was much higher than in 1995, averaging 352.0 kcfs versus 225.7 kcfs last year. The spring peak river flow was also much higher at 432.8 kcfs on 31 May compared to last year's 20 May peak of 304.5 kcfs. For June and July, river flow averaged 32 1.5 kcfs versus 244.7 kcfs last year. Flows fell gradually throughout the summer and fall averaging 171.7 kcfs for August and September, (Figure 5) which was still higher than the average (123.5 kcfs) for the same period in 1995.

Spill

The high river flow forced more spill throughout the passage season, averaging about 20% of river flow all season. This compares to an average of 2.7% of river flow last year. These levels exceeded the maximum spill for compliance with the 120% total dissolved gas limit imposed by the water quality departments within Washington and Oregon.

TABLE 1. SUMMARY OF 1996 SMOLT MONITORING AT JOHN DAY AND BONNEVILLE DAMS.

SPECIES	SITE	TOTAL SAMPLE	TOTAL PIT TAGS'	TOTAL BRANDS	DAILY COLLECTION[2]	DAILY FPI[3]	HOURLY COLLECTION	HOURLY FPI[4]
Yearling Chinook	John Day (3B)	14,560	2,092	255	38,975	738,311	38,995	737,815
	Bonneville PH#I	7,825	2,639	55	77,780	360,961	82,434	470,119
	Bonneville PH#2[5]	3.059	28	36	—	—	—	—
Subyearling Chinook	John Day (3B)	31,157	197	130	46,232	737,841	46,238	747,428
	Bonneville PH#I	29,556	136	44	432,364	1,593,073	350,426	1,921,906
	Bonneville PH#Z	8,662	6	12	—	—	—	—
Wild Steelhead	John Day (3B)	3,973	141	—	11,903	228,911	11,875	229,600
	Bonneville PH#I	1,885	200	—	22,787	101,655	22,003	121,996
	Bonneville PH#2	182	—	—	—	--	—	—
Hatchery Steelhead	John Day (3B)	11,171	1,327	75	36,174	701,899	36,202	705,551
	Bonneville PH#I	5,083	1,453	59	58,825	254,448	58,033	314,846
	Bonneville PH#2	531	3	4	—	—	—	- -
Coho	John Day (3B)	8,551	5	2	27,043	504,863	27,021	511,251
	Bonneville PH#I	13,076	13	1	156,957	675,605	158,438	863,827
	Bonneville PH#2	4,296	—	—	—	—	—	—
Wild Sockeye	John Day (3B)	894	2	—	2,607	49,700	2,607	49,325
	Bonneville PH#I	504	17	—	5,112	20,520	5,166	26,911
	Bonneville PH#2	160	—	—	—	—	--	—
Hatchery Sockeye	John Day (3B)	298	20	—	766	14,884	760	14,797
	Bonneville PH#I	199	34	—	2,127	7,993	2,105	10,498
	Bonneville PH#2	36	—	—	—	—	—	—
SEASON TOTALS	John Day (3B)	70,559	3,784	462	163,700	2,976,409	163,698	2,995,767
	Bonneville PH#I	58,128	4,510	159	678,489	3,014,255	678,605	3,730,103
	Bonneville PH#2	16,926	38	52	—	—	—	—

Data Source: Fish Passage Center.

1 See Table B-2 for run/rearing type details.

2 Collection numbers = Sample number adjusted by sample rate.

3 Daily FPI= Daily Collection counts divided by proportion of river flow through sample unit.

4 Hourly FPI= Hourly collection counts divided by proportion of river flow through sample unit.

5 PH#2 sampled for fish condition only.

The Numbers

Sample Numbers

The total number of fish handled at John Day in 1996 was 70,559, a 40% decline from the 1995 total of 117,695. Species specific sample numbers expressed as a percent of 1995 sample numbers are as follows: coho: 144.7%, wild steelhead: 98.4%, subyearling chinook: 63.7%, hatchery steelhead: 59.1%, yearling chinook: 42.4% and sockeye 20%. Except for coho, fewer fish per species were handled in 1996 than in 1995. The reductions are the result of a modified subsampling routine that eliminated sample rate changes. Consequently, the sample rate had to be set low enough at the beginning of the day to avoid exceeding the target sample size for the 24 hour period.

Collection Estimates

The total hourly collection estimate for 1996, 163,698 fish, was about 55% of the 1995 estimate of 295,48 1 fish. Again, coho was the only species with higher numbers in 1996 than in 1995, although wild steelhead were about the same at 100.6%. Collection estimates for the remaining species, expressed as a percentage of 1995 collection estimates, are as follows: hatchery steelhead, 58.5%; yearling chinook, 43 .0%; sockeye, 17.7%.

Fish Passage Indices

Collection numbers are divided by the proportion of river flow through the sample unit to get a Fish Passage Index (FPI). The 1996 "daily" index total for all species combined was 2,976,409, about 69% of the 1995 "daily" FPI of 4,288,470. The "hourly" method generated an index total of 2,995,767, again, only about 69% of the 1995 "hourly" FPI of 4,3 19,265. The two methods differed by less than 1%. A breakdown by species for sample, collection, index, brand and PIT tag totals can be found in Table 1.

Percent composition using collection estimates was as follows: Steelhead, 29.4%; subyearling chinook, 28.2%; yearling chinook, 23.8%; hatchery steelhead, 22.0%; coho, 16.5%; wild steelhead, 7.4 %; sockeye, 2.1%.

Passage Patterns

Seasonal

The relative run timing among species and the duration of the middle 80% (in days) are presented in Figure 4.. Additionally, median dates for 10,50, and 90 percent passage dates for all species were calculated from the "Daily" indices provided by the Fish Passage Center for all years of airlift sampling (1985 to 1996) for all species. Wild and hatchery steelhead dates are only calculated from 1990 to 1996 data. Prior to 1990, wild and hatchery stocks were not differentiated. Seasonal passage patterns are presented graphically in Figure 5 showing the seasonal peaks for each species.

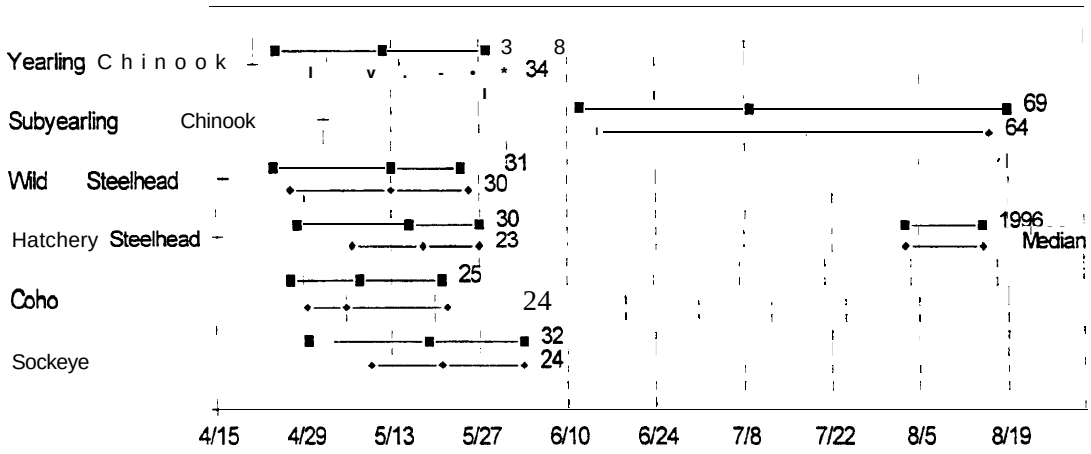


Figure 4. The 10%, 50%, and 90% passage dates and the historical median (n=7 for steelhead, n= 2 for salmon species) at John Day Dam, 1996. The duration in days between the 10% and 90% passage dates is indicated for each line.

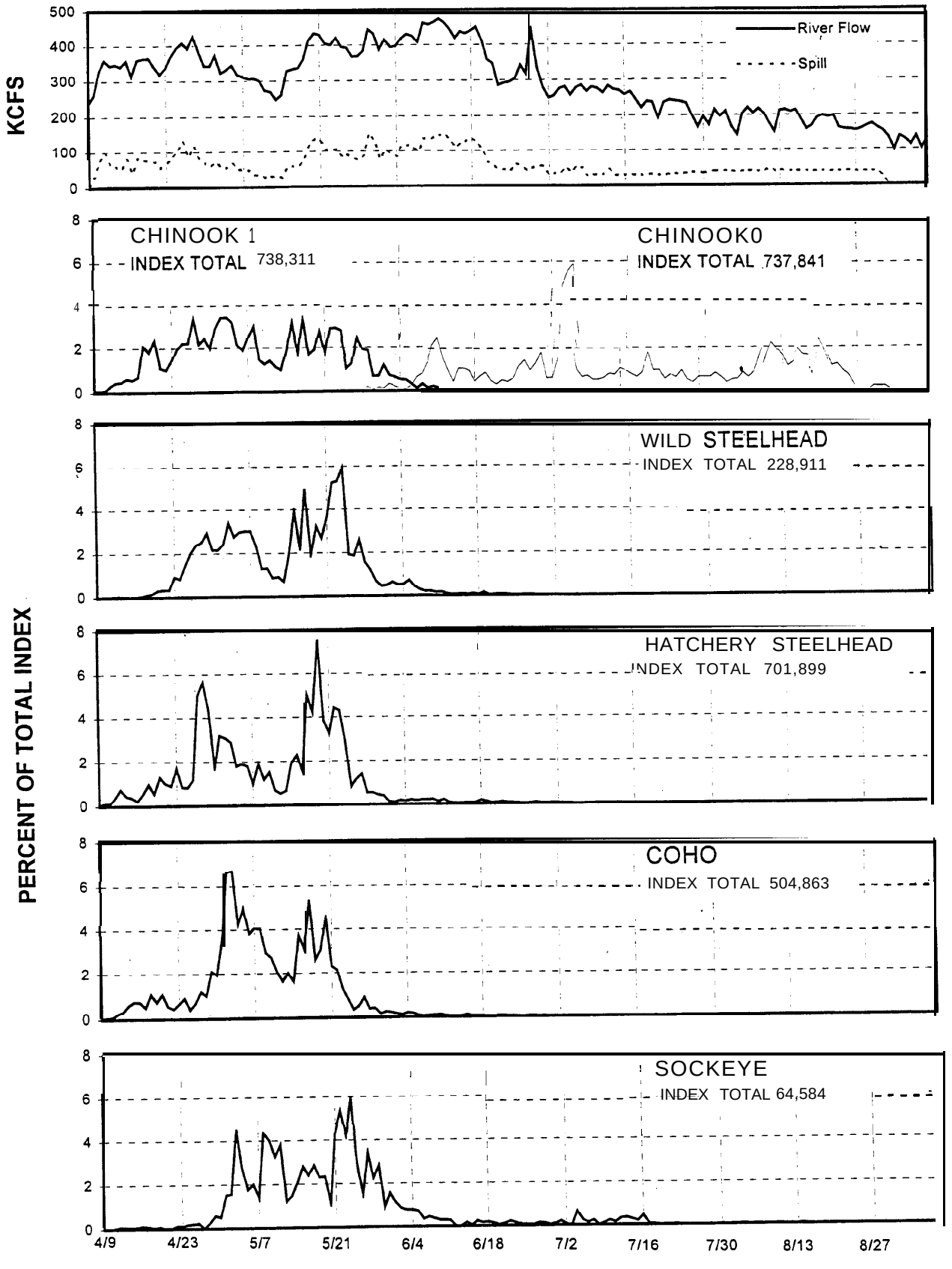


Figure 5. Seasonal passage patterns and daily average flows for John Day Dam, 1996. Based on "daily" indices from 3B.

Compared to historical medians, 10 and 90 percent passage dates were early or about the same this year for all species (Figure 4). Compared to 1995, the middle 80% of the run took longer to pass John Day Dam for all species, despite higher flows in 1996 (Figure C-2).

Presented in Figure C-l is an average seasonal passage pattern for all years of sampling for each species. Wild steelhead show the most variability around the beginning and end of the migration while the other stocks showed more variance around the peak of the migration.

Diel

Diel passage patterns are quite consistent over the season and with previous years in that the majority of passage for all species occurs at night, between the hours of 8pm and 6am (2001-0600 PDT) as shown in Table 2 and Figure 6.

Passage for all species, except subyearling chinook, increased after 1900 hours as ambient light decreased, and, as in 1995, dropped off sharply after two hours of peak passage at 2200 and 2300 hours. Subyearling chinook had a smaller and later peak, at midnight, with a more gradual decline throughout the rest of the night. Hatchery steelhead passage was more like the historical average with a 2300 hour peak and declining numbers thereafter, versus a 1995 pattern of increasing numbers throughout the night. About 30% of the wild steelhead and 28% of the coho were collected during the 2200-2300 hour sample block. The percent of total daily collection was below 5% from 0800 - 2000 hours for all species. Subyearling chinook passage peaked at 2400 hours with about 9% of total seasonal passage (Figure 6).

Table 2. Percent of passage occurring at night.

Species	% Night (2001-0600)
Yearling Chinook	**59.4**
Subyearling Chinook	63.3
Steelhead	
-Wild	75.8
-Hatchery	69.6
Coho	76.1
Sockeye	54.1

When compared to the historical average diel pattern, the 1996 pattern is similar for coho, sockeye, yearling chinook and wild steelhead. Again in 1996, as in 1995, the subyearling chinook diel pattern which exhibits decreasing numbers after a spike around midnight, is opposite the historical pattern of increasing numbers up to a spike at 0400 hours, (Figure 6 and Figure C-3).

A graphic presentation of the daily variation in the percent of night time passage is presented in Figure A-2. There can be considerable variability in the percent of night passage day to day, but the overall diel pattern of increased passage after dusk is consistent over the season and between years.

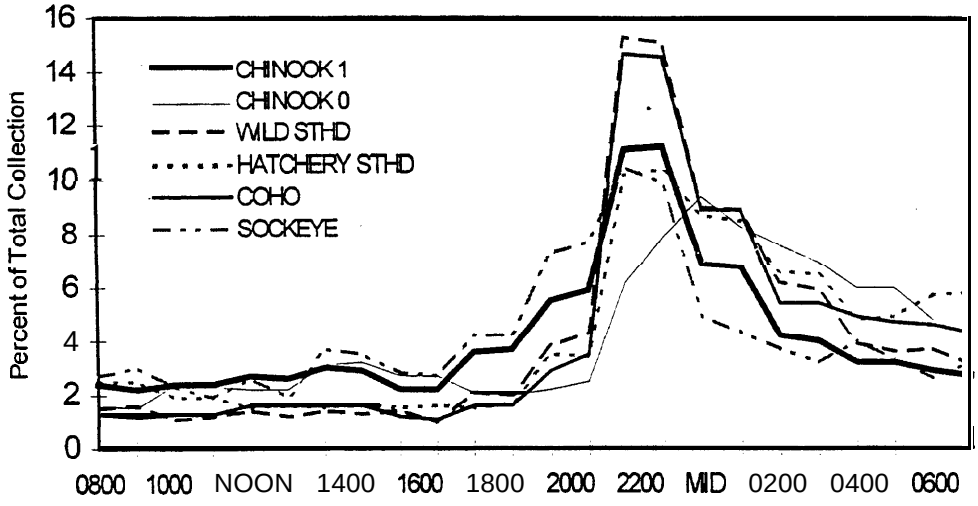


Figure 6. Seasonal diel passage pattern at John Day Dam, 1996.

Fish Condition

Descaling rates for yearling chinook (13.9%) and coho (6.8%) were higher in 1996 than in 1995, or any previous year except 199 1. Subyearling chinook and sockeye were lower in 1996 than in 1995 by 3.4 and 7.2 percentage points, respectively. Wild and hatchery steelhead descaling rates were about the same as the historical average in 1996 and 1995, at about 3.5% and 12%, respectively (Figure 7).

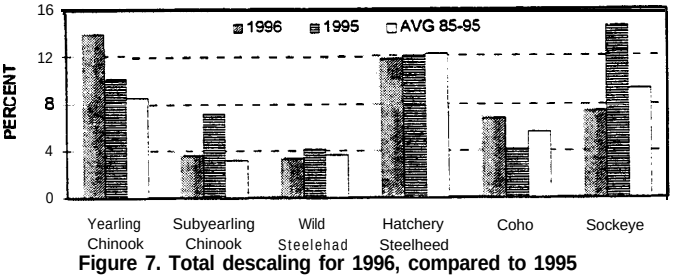


Figure 7. Total descaling for 1996, compared to 1995 and to the 85-95 average at John Day Dam.

Descaling rates were highly variable throughout the spring migration. Wild steelhead descaling peaked around the end of May and consistently had much lower descaling than hatchery steelhead. The first subyearling chinook migrants arriving in late May had the highest descaling with spikes ranging between 10% and 20% until the end of June. For the rest of the subyearling run, descaling did not exceed 10% (Figure A-3).

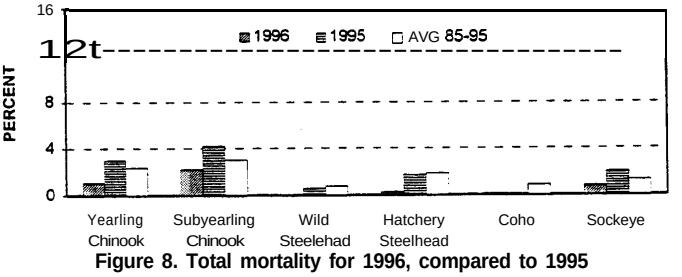


Figure 8. Total mortality for 1996, compared to 1995 and the 85-95 average at John Day Dam.

Overall descaling for each species and all years of sampling are shown in Figure C-5 and listed in Table C-3.

Mortality rates in 1996 were lower than 1995 and historical rates for all species. Subyearling chinook had the highest rate at 2.1%; all other species were below 1.1% (Figure 8 and Figure C-6).

Subsampled Fish Condition

This year, 11,884 smolts were examined for partial descaling (3% to 20% scale loss on a side), injuries, parasites and obvious disease symptoms including gas bubble disease. The results are presented in Tables C-4 - 9.

Gas bubble disease symptoms were observed in 25 fish this season, 22 of those were steelhead. Again in 1996, as in 1995, examinations using a dissecting microscope were conducted (see Methods section) on chinook and steelhead to monitor for signs of gas bubble disease. For the results of those exams, please see the Fish Passage Center Annual Report.

Partial descaling ranged from 12.0% on subyearling chinook to 4 1.1% for hatchery steelhead and was higher than last year for all species. Hatchery steelhead had the highest rates of operculum/gill injuries at 2.2% which is down from last year's rate of 6.5%. The incidence of attempted bird predation was much higher on hatchery steelhead (10%) than any other species (0.3% - 2%), but still lower than last year's rate of 15%. The number of parasites on steelhead was down considerably this year, dropping **from** 15% to 3.5% on wild fish and from 7.1% to 2.0% on hatchery fish.

Subyearling chinook had the highest rate of externally visible columnaris infection at 4%, which is up by one percentage point from last year (Table C-4 - 9).

3C Subsampled Fish Condition

Subsampling for condition monitoring was conducted about twice each week until sampling was terminated on 22 May. Descaling and mortality went from 4.6% and 4.4% on May 8 to 17.7% **and** 25% on May 22, respectively. On May 22 the funnel was inspected for debris plugs and one was found in the "shoulder" area a couple of feet down from the neck of the funnel. The neck area is monitored for debris plugs with a video system which showed no debris accumulating in that area. The video did reveal slow to moderate velocities in the neck area that smolts

could easily swim against. Sampling resumed after the funnel clean out. On 23 May a condition sample was taken revealing continued high descaling and mortality, 22% and 22.6% respectively. At this point comparative dipnet samples were taken from slots 3A and 9B where descaling was 10.9% and 16.3%, respectively, but mortality was zero. Again the funnel was removed, inspected, found to be clean and reinstalled. Video inspection of the gatewell revealed a heavy suspended debris load. However, high flow and the risk of increasing gas levels from shifting turbine flow to spill prevented the dewatering and cleaning of the unit, arid sampling resumed. On 24 May, a condition sample found no mortalities but still high descaling at 18.2%. The decision was made to terminate sampling in 3C. To compare fish condition in 3C without the funnel installed, a sample was dipnetted 3 1 May. The descaling rate of the fish in that sample was lower, 13.2%, and mortality was zero.

Length Averages

Length averages are presented in Figure 9 to show relative size differences and trends throughout the season. Hatchery steelhead are consistently the largest fish sampled and range between 200mm and 260mm all season. Wild steelhead and subyearling chinook tend to increase in size as the season progresses while yearling chinook and coho tend to decrease in size.

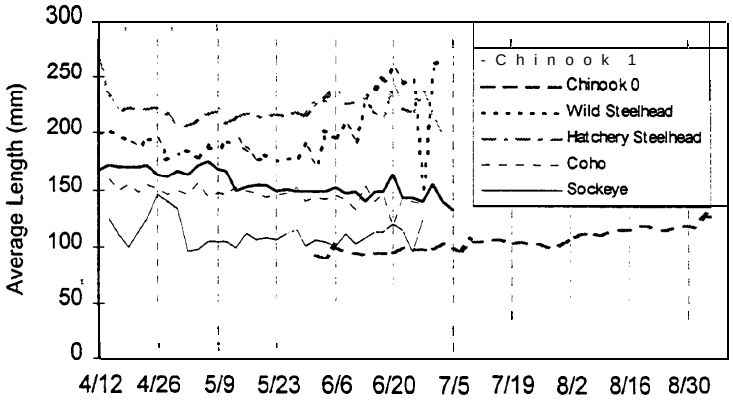


Figure 9. Average length of juvenile salmonids at John Day Dam, 1996.

PIT Tags, Freeze Brands, and Other Marks

The number of PIT tagged fish detected at the fish handling facility during the 1996 season (3,784) is about 1.3 times the number detected in 1995 (2,897), and 7.3 times the number detected in 1984 (5 16). See Table C-10 for a complete summary. The increase is primarily due to the operation of a second airlift in gatewell 3C from 1 to 29 May. This airlift accounted for 44.6% of all pit tag detections at John Day in 1996. Of the remaining 2,098 detections from 3B, 3 1.9% were detected by the coils on the sample pipe and the balance, 68.1%, were detected by the coils on the 3B bypass hose (Table A-l).

About 77% of the PIT tags detected were from hatchery fish. Yearling chinook and steelhead made up the majority of pit tagged fish representing 60.5% and 38.8%, respectively. A summary of the PIT tags detected, including species and travel time estimates can be found in Table A-2.

Again this year, a PIT tag recapture station was used to record condition data from PIT tagged fish that were part of the general sample. A total of 617 smolts out of 669 detections (92.2 %) were successfully handled for data collection (Table A-l). Any smolts that were detected but not handled were either not diverted or the PIT tag could not be read with the "paddle" detector at the recapture station (Table A-2).

A total of 462 brands were recorded this season, about 500 fewer than last year (1,060). Yearling chinook had the most brands (255), followed by subyearling chinook (130), summer steelhead (75), and coho (2) (Table 1). For more details on brands see Table A-3, and for a summary of brands per year by species, see Table C- 11.

This season, Elastomer tags used on fish released in the Umatilla River were observed in our samples. Elastomer tags are small pieces of colored plastic injected into the tissue behind the eye. A total of 628 elastomer tags were recorded.

Photonic tags were also used in the Umatilla River this year on a smaller scale, we recorded only 6. Photonic tags are made by injecting paint into the tissue of the anal fin.

Performance Monitoring

Personnel

Numerous tests were conducted this year to evaluate employee performance in the areas of species and brand identification, descaling and data recording.Overall, 96% percent of the possible data was collected and recorded correctly (Table 3).

Table 3. Results of the quality control tests.

Species ID	Descaling ID	Fin Clip	Brand ID	PIT tag scars	Elastomer tags	# Correct/ # Possible	Overall Accuracy
525/541	519/541	520/541	6/6	8/11	11/17	1589/1657	96%
97%	96%	96%	100%	73%	65%		

Equipment

Lost or biased sample time totaled 31 hours, representing <1% of the 1996 sampling season. This is about 20% less than in 1995 (38.5 hours) and about 55% less than in 1994 (69 hours). The subsampling routine (see Methods section) provided opportunities for minor repairs, funnel checks, etc., without interrupting sampling. See Table A-4 for details on biased sample days.

Fry Incidence

The number of summer/fall chinook fry (< 60mm) in the 3B samples this season was 105, which expanded to a collection estimate of 2 17. This is down from the 1,350 collected in 1995 but greater than the 47 collected in 1994. Fry were most abundant around the end of May.

Adult Catch

A total of 115 adult salmonids were captured by the 3B airlift this year. This is 84% of the 1995 number and 155% of the 1994 number. Seventy-three percent of these fish were steelhead (25% wild, 75% hatchery). For a complete listing of fallbacks by species and year, see Table C- 12.

A total of 76 adult salmonids were caught in the 3C airlift which operated between 1 and 25 May. Species composition was similar to 3B with 53% hatchery steelhead (n=40), 22% wild steelhead (n=17), 21% chinook adults (n=16), 3% chinook jacks (n=2), and 1 adult sockeye.

Incidental Catch

A summary of the incidental catch by species and year is presented in Table C-13.

American shad (Alosa sapidissima) was by far the most common incidental species captured at John Day Dam this season. The catch of juvenile shad for 1996, 56,245 was 28% of the 1995 total of 202,375. Shad passage peaked twice, the first time on 24 August and the second on 1 September (Figure A-4).

The total number of juvenile Pacific Lamprey (Lampetra tridentata) as classified in Systematics, Historical Ecology and North American Freshwater Fishes, edited by Richard L. Mayden, 1992. captured in gatewell 3B was down this year to 481. This is about 80% of the 1995 total of 596, but only 15% of the 1994 total of 3,250, and only 11% of the 1993 total of 4,348. Lamprey passage peaked near the end of April and again during the last week of May, (Figure A-4).

BONNEVILLE DAM

Flows and Spill

Spring river flow, up to 31 May, averaged 333.6 kcfs, compared to 216.7 kcfs in 1995. From 1 June through July, river flow averaged 315.4 kcfs, considerably higher than the 243.3 kcfs for the same period in 1995. Flows for the late summer/fall period, August through October, were also higher than in 1995, averaging 151.0 kcfs versus 126.5 kcfs last year (Figure 11).

Spill for the 16 March release of 7.7 million tule fall chinook from Spring Creek National Fish Hatchery (SCNFH) averaged about 132 kcfs (39.8% of river flow) for the period 14 March through 23 March. Spill averaged 175 kcfs (46.9% of river flow) between 18 and 27 April to facilitate passage of the 13 April SCNFH release of 4.3 million tule fall chinook. For the third SCNFH release of 3.7 million fish on 16 May, Spill was similar to the second release, averaging 178 kcfs (45.4% of river flow) (Table 4).

Table 4. 1996 Spring Creek National Fish Hatchery releases.

RELEASE DATE	RELEASE SIZE	PEAK PHI PASS.	AVG. RIV. FLOW (KCFS)	SPILL AS % OF RIVER
March 14	7.7 million	March 14	366.8	45.2
April 18	4.3 million	April 18	363.6	45.6
May 16	3.8 million	May 17	343.8	32.8

High river flow throughout the spring prevented the preferred second powerhouse (PH2) operating protocol of "last on first off' and shifting of flow from PH2 to spill after a Spring Creek release this year. Shifting of flow from PH2 to spill following a Spring Creek release is thought to increase the number of those fish passing the project via the spillway and improve survival.

Sample Numbers and Passage Indices

In 1996, smolt monitoring **in the First Powerhouse (PHl)** was reduced from 24 to 8 hour sampling. No attempt was made to expand the 8 hour index for 24 hours. The four years of 24 hour monitoring confirmed what we suspected, that the majority of juvenile fish passage occurs at night. More evidence of this is the 66% reduction in sampling effort resulting in only a 41% reduction in total sample numbers, from 98,942 in 1995 to 58,128 in 1996. The sampling season was the same both years from 11 March to 3 1 October. However, the reduction in collection estimates, both hourly and daily (see Methods section), matched the percent reduction in sampling effort at 66%. For both expansion methods the reduction was from about 2 million in 1995 to 678,000 in 1996. The reduction in the index numbers is slightly different for the two expansion methods, 5 1% for the Hourly method (from 7.6 to 3.7 million) and 57% for the Daily method (from 7 to 3 million). For a complete summary of 1996 sample, collection and Index numbers, see Table 1.

When 1996 index numbers are compared to 1991 index numbers, the most recent year with a similar 8 hour sampling schedule, the 1996 index (all species) is 106% of the 1991 index, 3,014,255 versus 2,819,263, respectively. Species specific differences were much greater, ranging from 19% for sockeye (28,5 13 versus 147,174) to 163% for hatchery steelhead (254,448 versus 155,754). The comparison for the rest of the species is as follows: yearling chinook, 59% (360,961 versus .609,411); subyearling chinook, 127% (1,593,073 versus 1,257,388); wild steelhead, 137% (101,655 versus 4,438); coho, 117% (675,605 versus 575,098).

For all species combined, the hourly index was 124% of the daily index. For all species the hourly method produced the larger index number. The hourly expansion method is thought to be more accurate because it accounts for the changing flow distribution by calculating indices hourly and summing for the day.

At **the Second Powerhouse,** a total of 16,926 smolts were sampled for fish condition and brand information (Table 1). The condition data are used as an indicator of the condition of the bypass system. Fish collection estimates and passage indices are not calculated.

Seasonal Passage Patterns

The passage pattern for all spring migrants was very similar, reaching the 10% point sometime between 19 April (yearling chinook) and 4 May (sockeye), and the 90% mark between 26 May (wild steelhead) and 2 June (sockeye). The number of days between the 10% and 90% dates ranged from 30 days for sockeye to 39 days for yearling chinook (Figure 10). Compared to the historical median passage timing, all species except subyearling chinook took longer to pass Bonneville dam. The difference ranged from 1 day for yearling chinook to 8 days for sockeye. The spring passage pattern (before June 1) for subyearling chinook mainly represents large releases of "tule" stock

into the Bonneville pool from Spring Creek National Fish Hatchery (SCNFH) (Table 4). No passage dates are calculated for these fish. The summer passage pattern for subyearlings (after June 1) is composed mainly of upriver bright stock. The 10% passage date was slightly later than the median date but the 90% date was earlier resulting in the middle 80% passage duration (40 days) being 10 days shorter than the historical median. (Figure 10). Passage timelines for all years and species are shown in Figure D-2.

Yearling chinook passage rose sharply during the end of April and sustained "percent of total values" between 3% and 5% through 6 May. From then through the end of the season, values stayed below 2%. Wild and hatchery steelhead and coho passage rose slightly later, closer to the end of April. Passage for all three groups increased again about 19 May after a large decline in passage during the second week in May. Sockeye passage peaked on 22 May at about 7% of total passage (Figure 11). The historical median passage graph for each species is shown in Figure D-l and includes a line representing standard deviation on each day throughout the passage season.

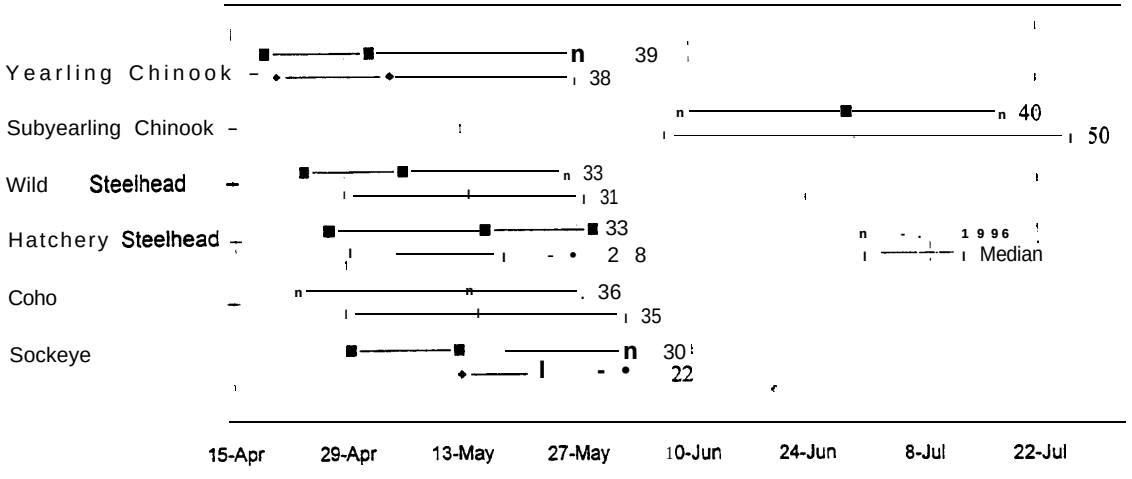


Figure 10. The 10%, 50%, and 90% passage dates and the combined historical median at PH #1, Bonneville Dam, 1996. The duration in days between the 10% and 90% passage dates is indicated for each line.

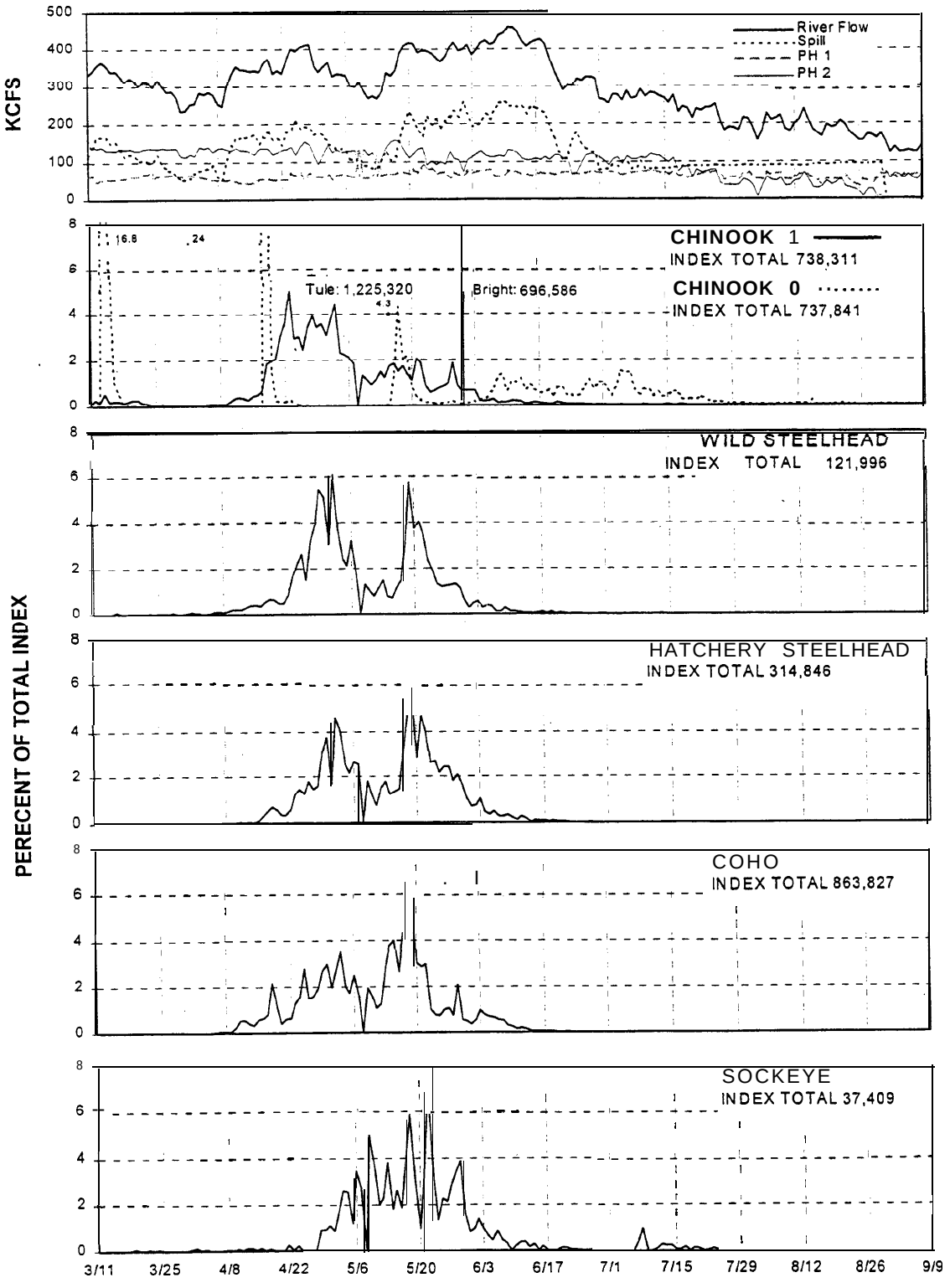


Figure 11. Seasonal passage patterns and daily average flows for PH #1, Bonneville Dam, 1996. Based on "daily" indices from PH #1.
*** Spring Creek Fish Hatchery releases of tule fall chinook.**
_ Indicates biased sample days.

Diel Passage Patterns

In 1996, sampling at Bonneville returned to 8 hours per day, as was done prior to 1992, so there is no 24 hour diel pattern to discuss. However, the 8 hour passage pattern documents the increase in passage at dusk as seen in the previous 4 years of 24 hour monitoring (Figure 12). Peak passage for all species, except hatchery steelhead, occurred at 2200 hours. Hatchery steelhead sample numbers continued to increase at 2300 and 2400 hours, contrary to the other species and the average pattern for hatchery steelhead generated over the previous four years (Figure D-3).

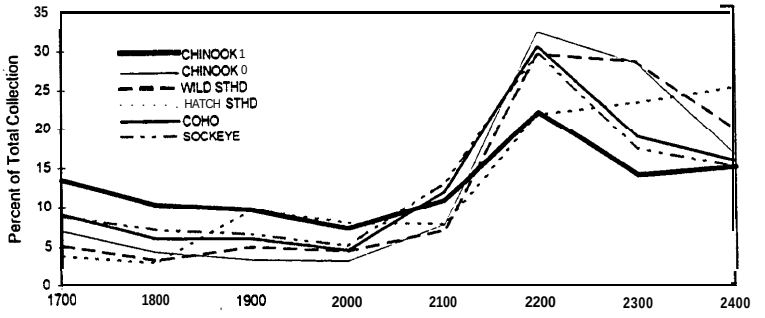


Figure 12. Seasonal diel passage patterns from PH-1 at Bonneville Dam, 1996.

The diel passage patterns of "tule" and "bright" stocks of subyearling chinook were both consistent with previous years' patterns. Upriver bright stock (after 1 June) is very similar to the spring migrant pattern of peaking at 2200 or 2300 hours and dropping off sharply thereafter. Tule passage increased at 2200 hours but, was still near that peak at 2400 hours (Figure 13).

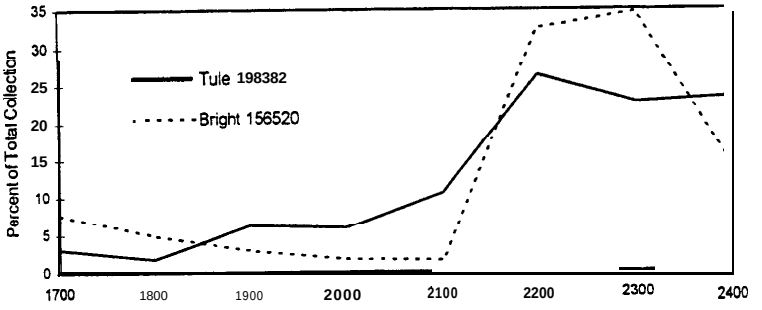


Figure 13. Seasonal diel passage patterns of subyearling chinook stocks from PH-1 at Bonneville Dam, 1996.

Fish Condition

Powerhouse 1. Descaling for all species, except coho, was lower in 1996 than in 1995 and nearly equal to or lower than the historical average for all species (Figure 14; Table D-3). Coho descaling was only slightly higher at 2.5% in 1996 versus 2.2% in 1995. Daily descaling rates for yearling chinook, varied between 0% and 10% most of the season except on 11 and 24 August when descaling peaked at 19% and 24%, respectively. Hatchery steelhead descaling varied widely throughout May with 4 peaks around 15%. Wild steelhead descaling was consistently lower than hatchery steelhead and peaked at about 8% near the end of April. Subyearling chinook descaling was below 5% until the end of July and middle of August when it peaked at around 10% (Figure B-2). Overall mortality rates for sampled fish were less than 1% for all species (Figure 15).

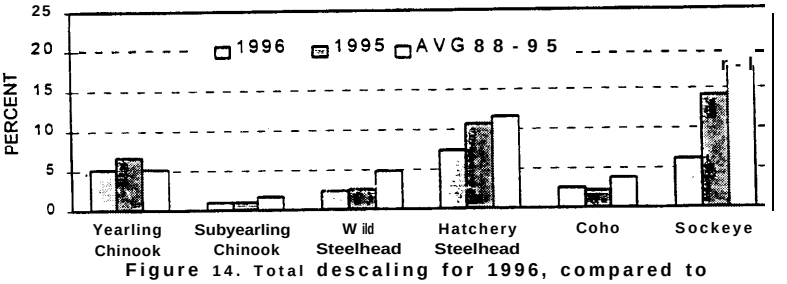


Figure 14. Total descaling for 1996, compared to 1995 and the 88.95 average at Bonneville Dam PH#I.

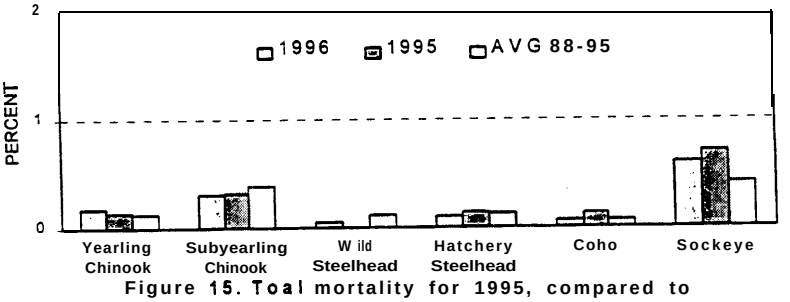


Figure 15. Toal mortality for 1995, compared to 1995 and the 88-95 average at Bonneville Dam PH#1.

Powerhouse 2. Descaling and mortality rates for the fish sampled at PH2 are presented in Table 5. As in past years, PH2 descaling and mortality rates were higher than PH1 rates with one exception, wild steelhead descaling (2.4% in PH1 versus 0.6% in PH2). PH2 descaling rates for yearling and subyearling chinook were double PH1 rates, 10% versus 5.1% and 2% versus 0.9%, respectively. The PH2 sockeye descaling rate was nearly triple the PH1 rate, 17.2% versus 6.2%, respectively. Coho and hatchery steelhead descaling rates were about equal at both powerhouses (Table D-3, D-4).

Descaling rates for yearling and subyearling chinook were higher than the historical average, but for steelhead, coho, and sockeye, descaling was lower than the historical average. For a summary of descaling and mortality in PH2, see Table D-4.

Like descaling, overall higher mortality at PH2 is consistent with past years. The highest mortality rate was for sockeye (2%). All other species had a 0.5% or lower mortality rate (Table 6). It should be noted that delayed mortality may contribute to PH2's higher mortality since fish may be held for up to 24 hours before processing.

Table 5. Descaling and Mortality from PH2 at Bonneville Dam, 1995.

	CHIN-1	C H I N - O	STHD-W	STHD-H	COHO	SOCK	TOTAL
TOTAL SAMPLED	3,059	8,662	182	531	4,296	196	16,926
% DESCALED	10.0%	2.0%	0.6%	9.1%	3.0%	17.0%	7.0%
% MORTALITY	0.5%	0.3%	0.5%	0.2%	0.4%	2.0%	0.7%

Subsampled Fish Condition

A total of 11,990 juvenile salmonids from PH1 were examined for detailed condition subsampling in 1996 (Tables D-5 - 10). As in 1995, partial descaling was the most prevalent condition and hatchery steelhead had the highest incidence at 27.6%, followed by sockeye at 13.4%, yearling chinook at 12.8%, coho at 10.2%, wild steelhead at 9.0%, and subyearling chinook at 4.6%. Ten percent of the hatchery steelhead examined had attempted bird predation injuries which is up from 8.29% last year. Hatchery steelhead also had the highest incidence of body injuries (2.1%), operculum damage (3.5%), and fungus (0.8%). Wild steelhead had an 8.1% incidence of external parasites, less than half the 1995 rate of 19%.

Gas bubbles were also looked for in the condition subsampling. This year, bubbles 'were found in the eye and operculum area and the dorsal fin of two wild steelhead. However, the primary tool for monitoring for the presence of gas bubbles was the dissecting microscope exams conducted on chinook and steelhead. For more details on the results of those exams, please consult the Fish Passage Center Annual Report.

Length Averages

Individual fish lengths were obtained in conjunction with the fish condition subsampling described above. The results are presented in Figure 16.

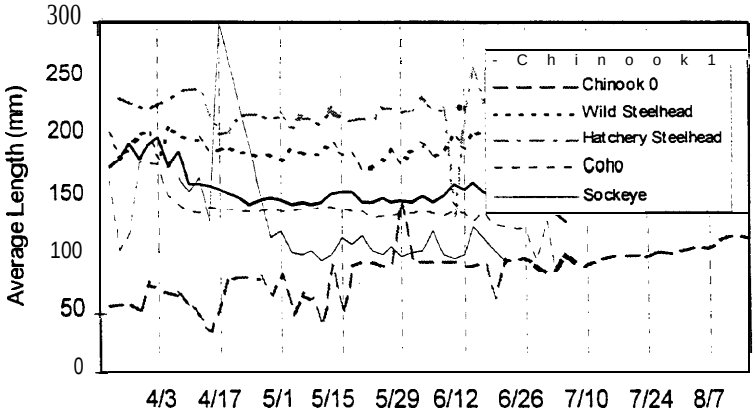


Figure 16. Average length of juvenile salmonids at Bonneville Dam, PH1, 1996.

PIT tags, Brands, and other marks

A total of 4,548 PIT tags were detected in the samples at PHI (Table 1). This is about 14 times the number detected in 1995. The increase is due to the installation of a flat plate PIT tag interrogation system in the first powerhouse bypass channel (see Methods section). A detailed summary of PIT tag detections including travel time and rates can be found in Table B-l. The PIT tag tunnel/diverter system was used again in 1996

allowing condition data to be collected on sampled fish. Estimates of diversion efficiency by species are listed in Table B-2. Table D-l 1 summarizes PIT tag records for all years of interrogation at Bonneville Dam, PHI. Also in 1996, sample fish from the second powerhouse were interrogated for PIT tags. A total of 38 tags were detected.

A total of 196 brands were recorded from the PHl samples. Thirty-seven percent of the brands were on hatchery steelhead, about 35% were on yearling chinook and about 28% were on subyearling chinook. Table 1 lists the number of brands by species and Table B-3 provides detail on release site and recapture rate by species. Table D-12 lists the number of brands for each species for all years of monitoring.

At PH2, a total of 52 brands were recorded. About 69% of those brands were found on yearling chinook, 23% on subyearling chinook and 7.7% on hatchery steelhead. Table 1 lists the number of brands by species and Table B-4 provides detail on release site and recapture rate by species.

Fry Incidence

In 1996 sample catches of subyearling chinook fry and coho fry (<60mm) were 79 and 9, respectively. When expanded by sample rate, these numbers generate a collection estimate of 647 chinook fry and 79 coho fry. These numbers are down dramatically from 1995 when the chinook fry estimate was 30,440 and the coho estimate was 1,914. Part of the discrepancy could be explained by the reduction in sampling from 24 to 8 hours per day. Sample and collection numbers for fry between 1992 and 1996 are listed in table D- 15.

Adult Incidence

Five adult fish were recorded as incidentals during the 1996 season. Three of these were steelhead, one was a chinook, and one was a sockeye. For a summary of fallbacks by year, see Table D-l 3.

Incidental Catch

American Shad (Alosa sapidissima) juveniles were present in the samples from mid August through the end of the season (Figure B-3). The total number sampled was 63,638, which when expanded for sample rate was over 3 18,000. Again, it is important to remember the reduction in sampling **effort,** from **24** to **8** hours per day. **Pacific Lamprey** (Lampetra tridentata) juveniles were most abundant during the last half of May (Figure B3). The total number of lamprey sampled was 19, which generated a collection estimate of 19. All of these were smolted. A summary of incidental catch for the years 1988 - 96 is presented in Table D-14.

Performance Monitoring

Personnel

A small number of performance monitoring tests were done this year due partly to a lack of emphasis but mostly to a cumbersome technique (see Methods section). Of the tests conducted, personnel achieved an overall accuracy of 98.6%.

Equipment

At PH1 a total of 23 hours of sampling were missed, about 1 .0% of the season. See Table B-5 for more details on lost sample time.

At PH2, no samples were lost or biased due to equipment problems. The PH2 sampler was taken out of service during the large releases of Tule fall chinook from the Spring Creek National Fish Hatchery (SCNFH).

ACKNOWLEDGMENTS

Support for this monitoring project comes from the region's electrical ratepayers through the Bonneville Power Administration under the Northwest Power Planning Council's Fish and Wildlife Program. The success of this program continues to involve cooperative interaction with the U.S. Army Corps of Engineers on-site biologists and deck crews, the Fish Passage Center staff, and the Environmental and Technical Services Division of the National

Marine Fisheries Service.

We acknowledge the very capable efforts of our Biological technicians and laborers, including at Bonneville: Tom Ryan, John Barton, Carol Morat, Bruce Mills, Nancy Diana, and at John Day: Greg Kovalchuk, Jack Janisch, James Thomas, Christine Wells, Shirley Witalis, and Doug Frantum.

LITERATURE CITED

Brege, Dean A., R.C. Johnsen, and W.E. Farr, 1990. An Airlift Pump for Sampling Juvenile Salmonids at John Day Dam. North American Journal Fisheries Management 10:48 l-483.

Fish Passage Manager, 1994. 1993 Fish Passage Center Annual Report. Columbia Basin Fish and Wildlife Authority, Portland, OR. 60p plus Appendices. (Annual Report to BPA for project no. 94-033, contract DE-FC79-88BP38906).

Gessel, M.H., L.G. Gilbreath, W.D. Muir, and R.F. Krcma, 1986. Evaluation of the Juvenile Collection and Bypass Systems at Bonneville Dam- 1985. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, Wa. 63p plus Appendix. (Report to U.S. Army Corps of Engineers, Contract DACW57-83-H 001).

Hawkes, L.A., R.D. Martinson, R.J. Graves, D.R. Carroll and S. Killins, 1993. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities, Annual Reports. U.S. Dept of Comm., NOAA, NMFS, ETSD, Portland, OR. (Annual Reports to BPA for project no. 84-14, contract DE-AI79-85BP20733).

Martinson, R.D. R.J. Graves, M.J. Langeslay, L.A. Wood, and S. Killins, 1994. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities, Annual Reports. U.S. Dept of Comm., NOAA, NMFS, ETSD, Portland,.OR. (Annual Reports to BPA for project no. 84-14, contract DE-AI79-85BP20733).

Krcma, R. F., M. H. Gessel, W. D. Muir, S. C. McCutcheon, L. G. Gilbreath, and B.H.Monk, 1984. Evaluation of the Juvenile Collection and Bypass System at Bonneville Dam-1983. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, Wa. 56p plus Appendix. (Report to U.S. Army Corps of Engineers, Contract ACW57-83-F-03 15).

Matthews, G.M., D.L. Park, T.E. Ruehle, and J.R. Harman, 1985. Evaluation of Transportation of Juvenile Salmonids and Related Research on the Columbia and Snake Rivers, 1984. U.S. Dept. of Comm., NOAA, NMFS, NW&AFC, Seattle, WA., 27p. plus Appendix. (Report to U.S. Army Corps of Engineers, March 1985, Contract DACW68-84-H-0034).

McConnell, R.J, and W.D. Muir, 1982. Preliminary Evaluation of the Bonneville Juvenile Bypass System - Second Powerhouse. U.S. Dept. of Comm., NOAA, NMFS, NW&AFC, Seattle, Wa. 8p. (Report to U.S. Army Corps of Engineers, Contract DACW57-82-F-0398).

Mayden, Richard L., 1992. Systematics, Historical Ecology and North American Freshwater Fishes. Pg. 33. Stanford University Press, Stanford, California.

O'Leary, John A., Kynard, Boyd, 1986. Behavior, Length, and Sex Ratio of Seaward -Migrating Juvenile American Shad in the Connecticut River. Transactions of the American Fisheries Society 115:529-536, 1986.

APPENDIX A
JOHN DAY DAM - 1996

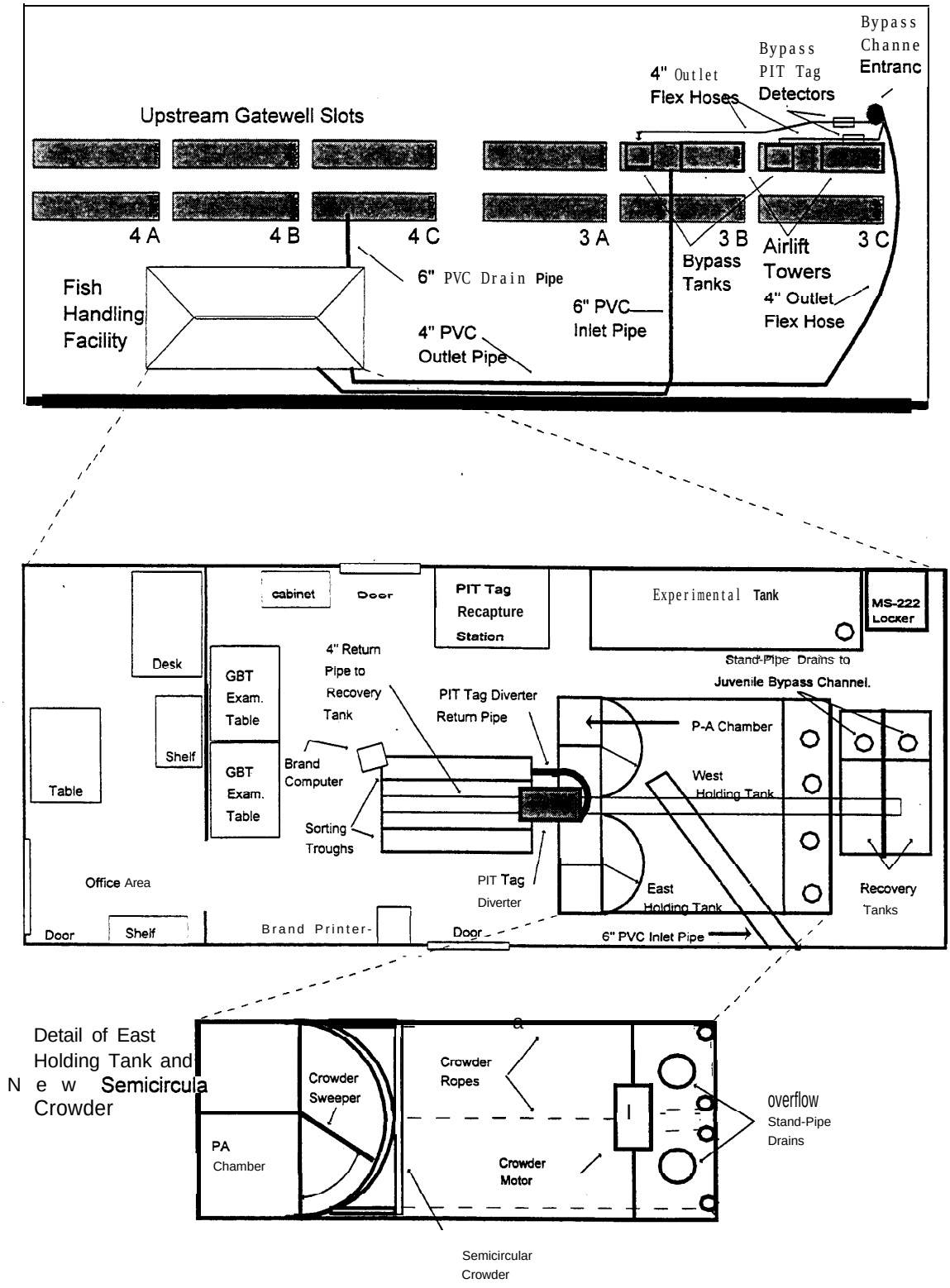


Figure A-l. Smolt monitoring system and handling facility at John Day Dam, 1996.

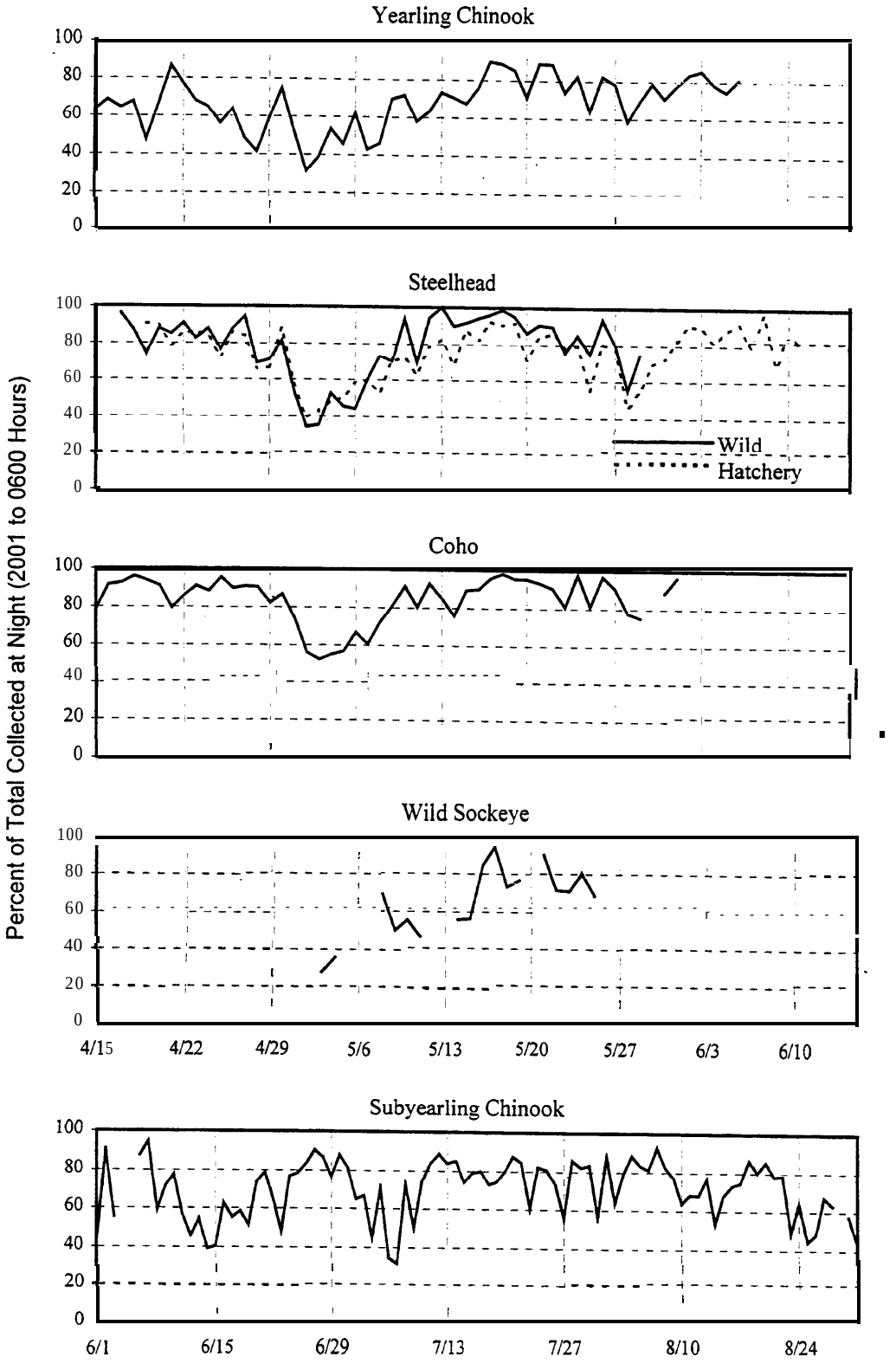


Figure A-2. Percent of daily total collection at night, 2001 to 0600 hours, (P.D.T.) at John Day Dam. Days with collection numbers < 50 were excluded.

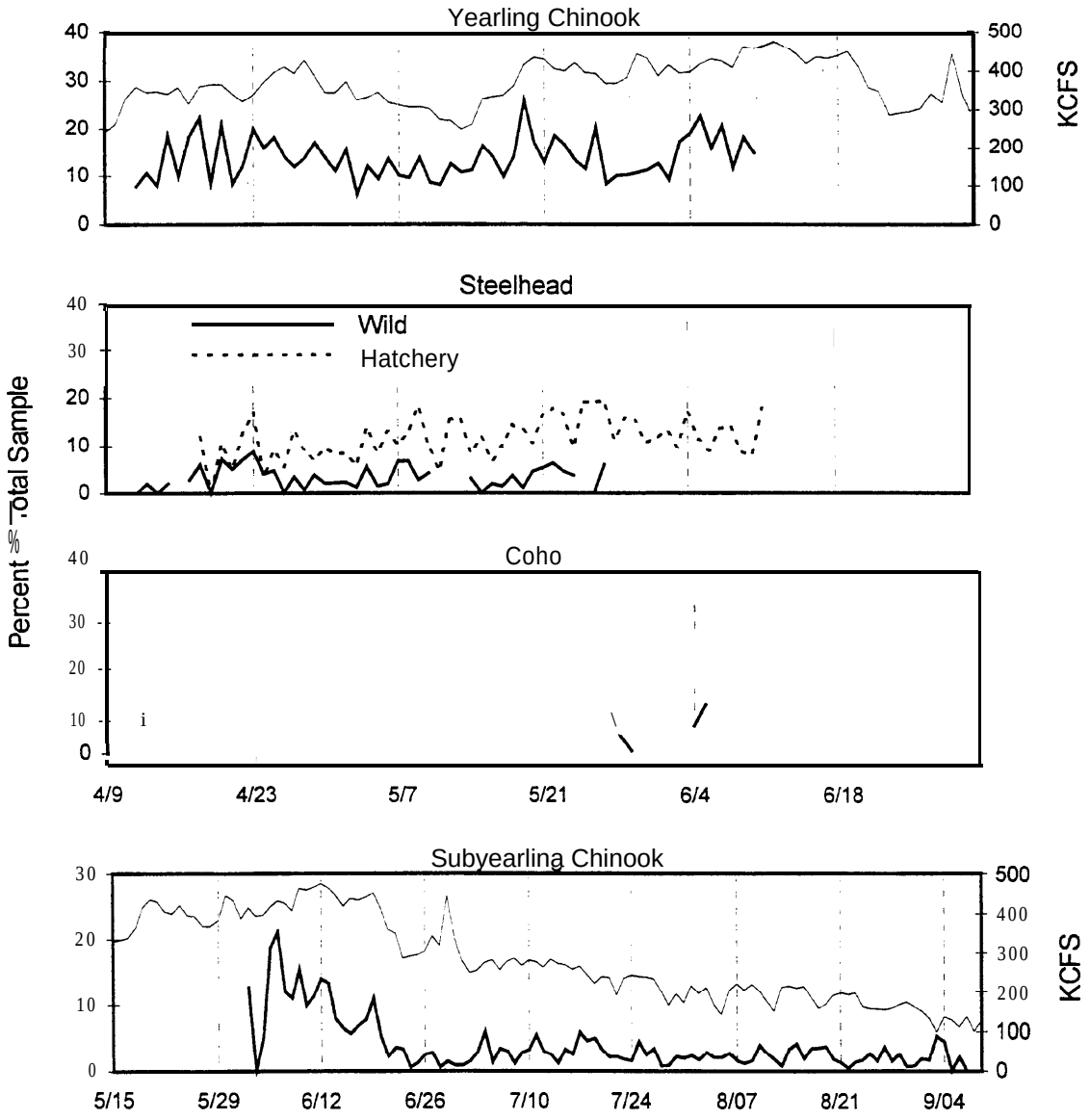
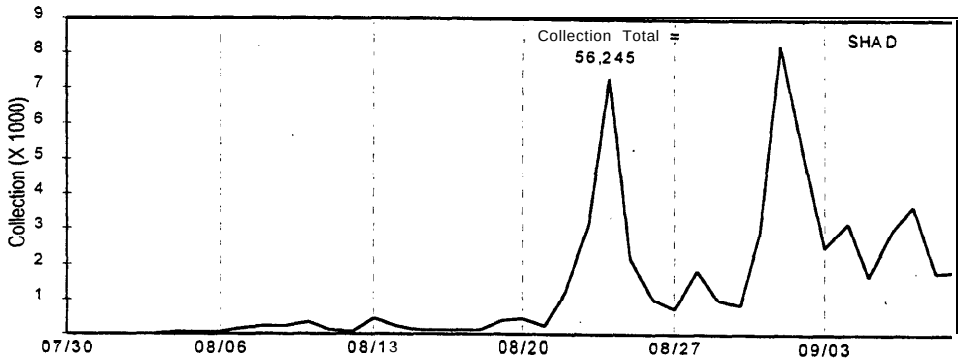


Figure A-3. Daily percent descaling and river flow at John Day Dam, 1996. Days with sample size less than 30 excluded.



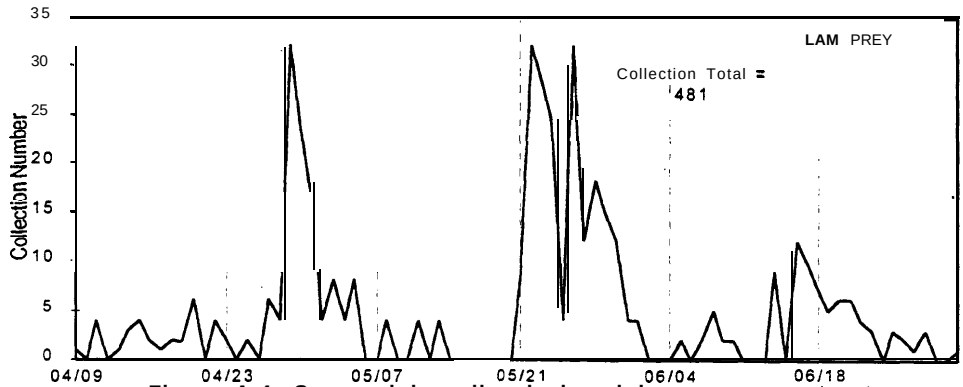


Figure A-4. Seasonal juvenile shad and lam prey counts at John Day Dam, 1996.

Table A-1. Summary of PIT tag observations at John Day Dam - 1996

Species	Run	Rearing Type	Total # Observed	3C Bypass	3B Bypass	Sample Detector	Recapture Station	Recapture Efficiency
Chinook	Spring	Hatchery	677	324	253	100	93	93.0
		Wild	37	13	16	8	8	100.0
		Total	714	337	269	108	101	93.5
	Summer	Hatchery	145	44	59	42	38	90.5
		Wild	40	17	14	9	9	100.0
		Unknown	1	0	0	1	1	100.0
		Total	186	61	73	52	48	92.3
	Fall	Hatchery	187	71	52	64	39	60.9
		Wild	10	0	3	7	7	100.0
		Total	197	71	55	71	46	64.8
	Unknown	Hatchery	795	369	312	114	115	100.9
		Wild	182	77	70	35	37	105.7
		Unknown	215	82	98	35	36	102.9
		Total	1192	528	480	184	188	102.2
	CHINOOK TOTAL		**2289**	**997**	**877**	**415**	**383**	**92.3**
Coho	Fall	Hatchery	5	0	1	4	4	100.0
	COHO TOTAL		**5**	**0**	**1**	**4**	**4**	**100.0**
Steelhead	Spring	Hatchery	5	3	0	2	2	100.0
	Summer	Hatchery	1321	612	496	213	203	95.3
		Wild	141	66	46	29	20	69.0
		Unknown	1	1	0	0	0	0.0
	STEELHEAD TOTAL		**1468**	**682**	**542**	**244**	**223**	**91.4**
Sockeye	Summer	Hatchery	8	2	3	3	3	100.0
	Unknown	Hatchery	12	4	5	3	2	66.7
		Wild	2	1	1	0	0	0.0
	SOCKEYE TOTAL		**22**	**7**	**9**	**6**	**5**	**83.3**
GRAND TOTAL			**3784**	**1686**	**1429**	**669**	**617**	**92.2**

Table A-2. PIT Tag observations at John Day Dam, 1996.

RELEASE SITE	SPP	RUN	RT	N=	TRAVEL TIME (DAYS) MEAN	MIN	MAX	RIVER KM ABOVE JDA	AVG SPEED (KM/DAY)
BIG Canyon Creek	Steelhead	Summer	Wild	5	13 7	9.5	184	456	33 3
Big Canyon Facility	Steelhead	Summer	Hatchery	4	23.1	13.2	41:5	596	25.8
Catherine Creek	Chinook	Spring	Wild	203	119.5	47.0	240.6	678	5.7
Clear Creek .	Chinook	Spring	Hatchery		35.4	17.8	55.5	523	14.8
	Steelhead	Summer	Hatchery	17	19.8	9.5	39.5	523	26.4
Cteat-water River	Chinook	Fall	Hatchery	8	71.4	58.4	89.2	399	5.6
	Steelhead	Summer	Hatchery	7	14.8	7.5	31.7	399	27.0
Clearwater River, N.Fork	Chinook	Spring	Hatchery	40	38.3	19.5	47.1	464	12.1
Clearwater River, S.Fork	Steelhead	Summer	Hatchery	20	19.1	11.4	39.4	519	27.2
Columbia River	Chinook	Fall	Wild	10	46.3	31.4	80.1	N/A	
Crooked River	Steelhead	Summer	Hatchery	13	35.0	16.9	66.5	613	17.5
Crooked River Pond	Chinook	Spring	Hatchery	5	42.5	34.3	58.5	828	14.8
Curl Lake Rearing Pond	Chinook	Spring	Hatchery	11	37.3	32.3	53.9	354	9.5
	Steelhead	Summer	Hatchery	7	32.2	20.5	44.4	354	11.0
Dryden Acclimation Pond	Chinook	Summer	Hatchery	5	13.8	10.8	21.7	433	31.4
Dworshak Hatchery	Steelhead	Summer	Hatchery	93	17.1	II.5	25.6	464	27.1
Entiat Hatchery	Chinook	Spring	Hatchery	9	43.4	25.3	60.6	448	10.3
Fish Creek	Steelhead	Summer	Wild	12	430.7	238.0	594.5	595	1.4
Fish Creek Trap	Steelhead	Summer	Wild	10	254.4	212.7	332.9	697	2.7
Gedney Creek	Steelhead	Summer	Wild	6	273.8	244.1	290.2	585	2.1
Grande Ronde River	Steelhead	Summer	Hatchery	7	13.6	8.6	16.4	446	32.8
Hazard Creek	Steelhead	Summer	Hatchery	6	32.1	18.9	42.6	649	20.2
Hells Canyon Dam	Steelhead	Summer	Hatchery	9	36.9	23.4	46.1	572	15.5
Herd Creek	Steelhead	Summer	Hatchery	13	28.0	21.4	32.7	1044	37.3
Imnaha River	Chinook	Fall	Wild	5	241.9	230.0	254.1	483	2.0
Imnaha River Trap	Chinook	Summer	Hatchery	7	35.9	29.1	48.5	490	13.6
	Chinook	Summer	Wild	24	65.6	15.1	200.9	490	7.5
	Steelhead	Summer	Hatchery	14	14.7	7.4	24.4	490	33.3
	Steelhead	Summer	Wild	45	12.6	8.1	20.6	490	38.9
Imnaha River Weir	Chinook	Spring	Hatchery	39	42.6			557	13.1
	Chinook	Fall	Wild	4	204.4	193.1	226.1	557	2.7
Knox Bridge	Chinook	Summer	Hatchery	114	44.2	27.1	60.9	805	18.2
Leavenworth Hatchery	Chinook	Spring	Hatchery	11	28.8	17.1	45.3	453	15.7
Lemhi River	Steelhead	Summer	Hatchery	6	29.4	14.2	38.2	894	30.4
Liffle Goose Dam FBY	Steelhead	Spring	Hatchery	5	7.5	5.4	10.7	288	38.4
	Steelhead	Summer	Hatchery	I2	7.9	5.6	14.7	288	36.5
Little Salmon River	Steelhead	Summer	Hatchery	21	36.8	19.8	26.2	478	13.0
Little Sheep Facility	Steelhead	Summer	Hatchery	17	25.9	15.4	39.3	528	20.4
Lolo Creek	Coho	Fall	Hatchery	4	19.8	9.4	42.8	486	24.5
Lookingglass Creek	Chinook	Spring	Wild	5	218.2	189.7	235.1	583	2.7
Lookingglass Hatchery	Chinook	Spring	Hatchery	72	36.4	23.7	46.3	586	16.1
Lower Granite Dam FBY	Steelhead	Summer	Hatchery	264	12.1	6.1	30.7	348	28.8
Lower Granite Dam BR	Chinook	Unknown	Hatchery	I2	13.9	9.2	27.7	348	25.0
	Chinook	Unknown	Unknown	5	12.0	9.0	15.6	348	29.0
Lower Granite Dam RRR	Chinook	Unknown	Hatchery	669	14.7	6.5	31.7	348	23.7
	Chinook	Unknown	Unknown	177	13.8	7.7	28.6	348	25.2
	Chinook	Unknown	Wild	143	14.6	8.5	31.4	348	23.8
Lower Granite Dam TAL	Steelhead	Summer	Hatchery	266	11.8	6.2	32.2	348	29.5
Lyons Ferry Hatchery	Chinook	Fall	Hatchery	27	19.4	8.5	34.6	270	13.9
March Creek Trap	Chinook	Spring	Wild	5	224.2	206.4	244.3	978	4.4
Minam River	Chinook	Spring	Wild	4	257.3	254.9	259.5	593	2.3
Pahsimeroi River Trap	Steelhead	Summer	Hatchery	24	21.6	11.0	38.6	969	44.9
Powell Rearing Pond	Chinook	Spring	Hatchery	56	44.6	29.1	70.5	669	15.0
RApid River Hatchery	Chinook	Spring	Hatchery	205	55.8	27.3	73.0	631	11.3
Redfish Lake	Sockeye	Summer	Hatchery	1	232.1			1098	4.7
Redfish Lake Creek Trap	Sockeye	Summer	Hatchery	6	23.1	17.1	28.0	1096	47.4
Red River	Steelhead	Summer	Hatchery	38	32.9	15.2	53.7	620	18.8
Rock Island Dam	Chinook	Unknown	Hatchery	17	29.7	9.5	302.0	383	12.9
	Chinook	Unknown	Unknown	32	20.6	8.2	50.9	383	18.6
	Sockeye	Unknown	Hatchery	I2	9.7	7.2	14.1	383	39.5
	Sockeye	Unknown	Wild	2	9.2	8.3	10.2	383	41.6
	Steelhead	Summer	Hatchery	57	8.6	5.5	17.6	383	44.5
	Steelhead	Summer	Wild	I7	9.1	5.2	13.4	383	42.1
Salmon River	Chinook	Spring	Hatchery	4	44.2	38.1	60.5	478	10.8
	Steelhead	Summer	Hatchery	24	29.1	18.8	47.6	478	16.4
Salmon River Trap	Chinook	Unknown	Hatchery	27	39.7	20.4	62.4	563	14.2
	Chinook	Unknown	Wild	26	34.1	12.3	62.5	563	16.5
	Steelhead	Summer	Hatchery	37	17.8	9.2	31.5	563	31.6
	Steelhead	Summer	Wild	5	16.9	9.8	34.7	563	33.3
Salmon River, N.Fork	Steelhead	Summer	Hatchery	6	31.7	21.8	36.9	859	27.1
Salmon River, S.Fork Trap	Chinook	Summer	Wild	4	227.3	215.6	238.5	804	3.5
Sawtooth Hatchery	Steelhead	Summer	Hatchery	9	24.6	11.1	37.3	1095	44.5
Sawtooth Trap	Steelhead	Summer	Hatchery	18	28.5	16.6	40.6	1095	36.4
Similkameen Pond/Hatchery	Chinook	Summer	Hatchery	9	39.8	27.4	65.3	723	18.2
Snake River	Chinook	Fall	Hatchery	138	76.5	13.1	339.3	175	2.3
	Chinook	Unknown	Hatchery	40	28.3	18.3	42.2	175	6.2
	Steelhead	Summer	Hatchery	229	14.3	7.0	34.5	175	12.2
Snake River Trap	Chinook	Unknown	Hatchery	30	23.5	15.3	37.6	400	17.0
	Chinook	Unknown	Wild	9	18.7	10.5	30.8	400	21.4
	Steelhead	Summer	Hatchery	39	14.5	7.5	28.6	400	27.6
	Steelhead	Summer	Wild	20	9.7	6.5	14.5	400	41.2
Tucannon River	Chinook	Spring	Hatchery	4	35.0	27.6	46.0	275	7.9
	Steelhead	Summer	Hatchery	4	30.6	15.0	38.6	275	9.0
Tucannon River Hatchery	Chinook	Spring	Hatchery	6	55.2	47.0	67.8	344	6.2
Wells Hatchery	Chinook	Summer	Hatchery	10	30.8	9.5	49.0	483	15.7
Winthrop Hatchery	Chinook	Spring	Hatchery	8	34.9	13.6	46.6	577	16.5
UNKNOWN from CLWH	Steelhead	Summer	Hatchery	7	38.2	16.4	46.5	N/A	
			Total =	3700					

Note: Release Sites with n < 4 observations (84 Total Smolts) were excluded from this table except for sockeye.

able A-3. Band Release Totals and Observations at John Day Dam - 1996.

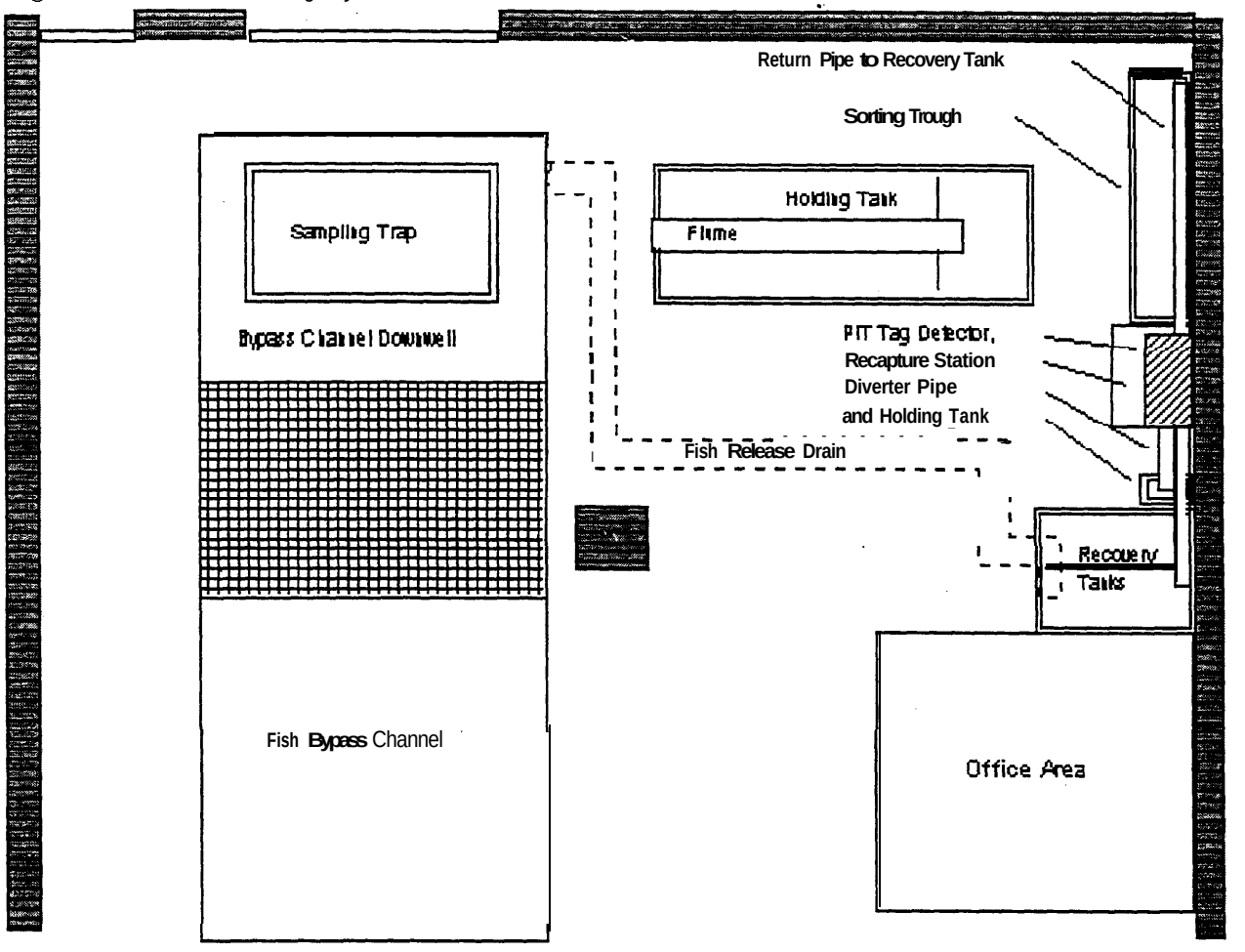
UN PECIES	LOC BRAND		ROT	AGENCY	RELEASE SITE	RELDATE START	END	RELEASE TOTALS REL #	SMPL	COLL	INDEX	PERCENT RECAPTURED %SMPL	%COLL	%INDEX	REL #	GROUP TOTALS SMPL	COLL	INDEX	PERCENT RECAPTURED %SMPL	%COLL	%INDEX
PRING	LA	F	3	NMFS	BELOW LGR	5/11	5/13	7506	12	44	950	0.16	0.59	12.7	69454	149	529	10355	0.21	0.76	14.9
HINOOK	LA	F	4	NMFS	BELOW LGR	5/13	5/16	7537	11	36	781	0.15	0.48	10.4							
	LA	PI	1	NMFS	BELOW LGR	4/09	4/21	7659	34	130	2436	0.44	1.70	31.8							
	LA	PI	2	NMFS	BELOW LGR	4/21	4/25	7534	24	92	1658	0.32	1.22	22.0							
	LA	A	3	NMFS	BELOW LGR	4/25	4/29	7613	22	81	1430	0.29	1.06	18.8							
	LA	PI	4	NMFS	BELOW LGR	4/29	5/03	7509	14	51	1040	0.19	0.68	13.9							
	LA	PP	1	NMFS	BELOW LGR	5/03	5/06	7508	10	40	897	0.13	0.53	11.9							
	LA	PP	2	NMFS	BELOW LGR	5/06	5/11	7913	9	34	737	0.11	0.43	9.3							
	IA	RT	1	NMFS	BELOW LGR	5/16	5/28	7459	12	20	402	0.16	0.27	5.4							
	LA	RT	2	NMFS	BELOW LGR	5/29	6/17	1216	1	1	24	0.08	0.08	2.0							
	LA	B	1	UMATILLA	IMEQUES	3/13	3/13	5083	14	18	317	0.28	0.35	6.2	33921	106	175	3120	0.31	0.52	9.2
	LA	B	2	UMATILLA	IMEQUES	3/13	3/13	5026	20	34	603	0.40	0.68	12.0							
	LA	B	3	UMATILLA	IMEQUES	3/13	3/13	4232	14	24	420	0.33	0.57	9.9							
	LA	B	4	UMATILLA	IMEQUES	3/13	3/13	4682	15	24	426	0.32	0.51	9.1							
	RA	B	2	UMATILLA	IMEQUES	3/13	3/13	4531	13	17	305	0.29	0.38	6.7							
	RA	B	3	UMATILLA	IMEQUES	3/13	3/13	5092	13	28	505	0.26	0.55	9.9							
	RA	B	4	UMATILLA	IMEQUES	3/13	3/13	5275	17	30	544	0.32	0.57	10.3							
ALL	RA	B	1	UMATILLA	IMEQUES	4/18	4/18	5197	4	10	185	0.08	0.19	3.6	96733	100	164	3259	0.10	0.17	3.4
HINOOK	LA	E	3	UMATILLA	IMEQUES	5/30	5/30	9980	16	19	408	0.16	0.19	4.1							
	LA	E	4	UMATILLA	IMEQUES	5/30	5/30	10389	8	12	256	0.08	0.12	2.5							
	RA	E	3	UMATILLA	IMEQUES	5/30	5/30	10237	16	18	385	0.16	0.18	3.8							
	RA	E	4	UMATILLA	IMEQUES	5/30	5/30	9965	11	14	293	0.11	0.14	2.9							
	LA	L	2	UMATILLA	IMEQUES	4/18	4/18	5111	4	16	289	0.08	0.31	5.7							
	RA	L	2	UMATILLA	IMEQUES	4/18	4/18	5218	10	37	640	0.19	0.71	12.3							
	LA	5	3	UMATILLA	IMEQUES	5/30	5/30	10420	3	4	84	0.03	0.04	0.8							
	LA	5	4	UMATILLA	IMEQUES	5/30	5/30	9407	9	12	253	0.10	0.13	2.7							
	RA	5	3	UMATILLA	IMEQUES	5/30	5/30	10252	13	14	305	0.13	0.14	3.0							
	RA	5	4	UMATILLA	IMEQUES	5/30	5/30	10557	6	8	161	0.06	0.08	1.5							
	LA	5	2	UMATILLA	THORNHOLLOW	5/31	5/31	10378	14	19	389	0.13	0.18	3.7	20694	27	36	747	0.13	0.17	3.6
	RA	5	2	UMATILLA	THORNHOLLOW	5/31	5/31	10316	13	17	358	0.13	0.16	3.5							
	LA	H	1	WDFW	RINGOLD SPR.	6/28	6/30	19002	1	4	74	0.01	0.02	0.4	39290	3	12	219	0.01	0.03	0.6
	LA	T	1	WDFW	RINGOLD SPR.	6/28	6/30	20288	2	8	145	0.01	0.04	0.7							
SPRING	RA	+T	1	YAKIMA	PROSSER TRAP	4/19	4/19	30	1	4	80	3.33	13.33	266.7	130	2	8	158	1.54	6.15	121.5
COHO	LA	+T	3	YAKIMA	PROSSER TRAP	4/25	4/25	100	1	4	78	1.00	4.00	78.0							
SUMMER	LA	A	1	ODFW	SPRING CR CHNL	4/09	4/23	19280	5	20	351	0.03	0.10	1.8	19280	5	20	351	0.03	0.10	1.8
STHD	RA	L	2	UMATILLA	BONIFER	4/24	4/26	8827	1	4	73	0.01	0.05	0.8	8827	1	4	73	0.01	0.05	0.8
	LA	IT	1	WDFW	LYONS FERRY	4/18	4/19	19861	11	40	740	0.06	0.20	3.7	58928	38	143	2640	0.06	0.24	4.5
	LA	IT	3	WDFW	LYONS FERRY	4/18	4/19	19095	11	41	748	0.06	0.21	3.9							
	RA	IT	1	WDFW	LYONS FERRY	4/18	4/19	19972	16	62	1152	0.08	0.31	5.8							
	LA	IV	1	WDFW	TOUCHET RIVER	3/27	5/02	38728	11	39	703	0.03	0.10	1.8	76981	26	95	1791	0.03	0.12	2.3
	LA	IV	3	WDFW	TOUCHET RIVER	3/27	5/02	38253	15	56	1088	0.04	0.15	2.8							
	RA	IV	1	WDFW	TUCANNON RIVER	4/15	4/15	29625	5	18	299	0.02	0.06	1.0	29625	5	18	299	0.02	0.06	1.0

Table A-4. Interruptions in the sampling season (154 days or 3696 hours) due to Unit 3 shutdowns (hours Out Of Service) and the number of hours effected by other incidents.

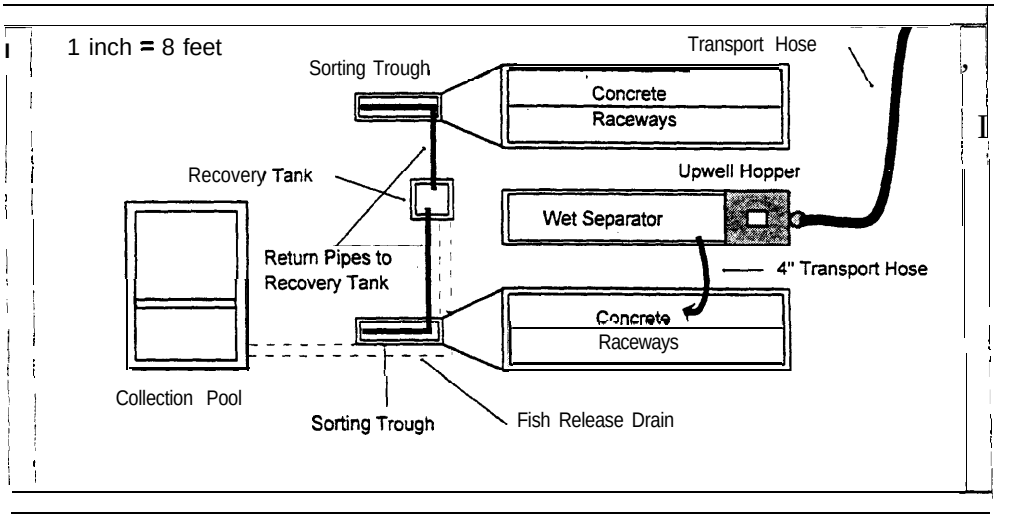
End Date	Batch Number	Unit 3 OOS	Airlift OOS	Net Hours OOS	Reason for Interruption
09-10-Apr	96002	0	3	3	Restrung sample trap cable
29-Apr	96022	10	10	10	Funnel & STSNBS inspection
30-May	96052	6	6	6	Funnel & STSNBS Inspection
8-Jun	**96061**	**0**	**3**	**3**	Funnel plug removal
18-Jun	96072	1	4	4	Funnel & STSNBS inspection
19-Jun	**96073**	**2.5**	**0**	**2.5**	**Unit 3 off-line**
24-Jun	96077	**0.5**	**0**	**0.5**	**Unit 3 off-line**
19-Jul	96102	**2**	**0**	**2**	**Unit 3 off-line** and Funnel Inspection
Total Hours		**22**	**26**	**= 31**	**Net hours** lost **or biased**

APPENDIX B
BONNEVILLE DAM - 1996

Figure B. 1. Smolt Monitoring System at Bonneville Dam, 1996. 1 inch = 4 feet



Smolt Sampling System at Bonneville Dam, PH2, 1996.



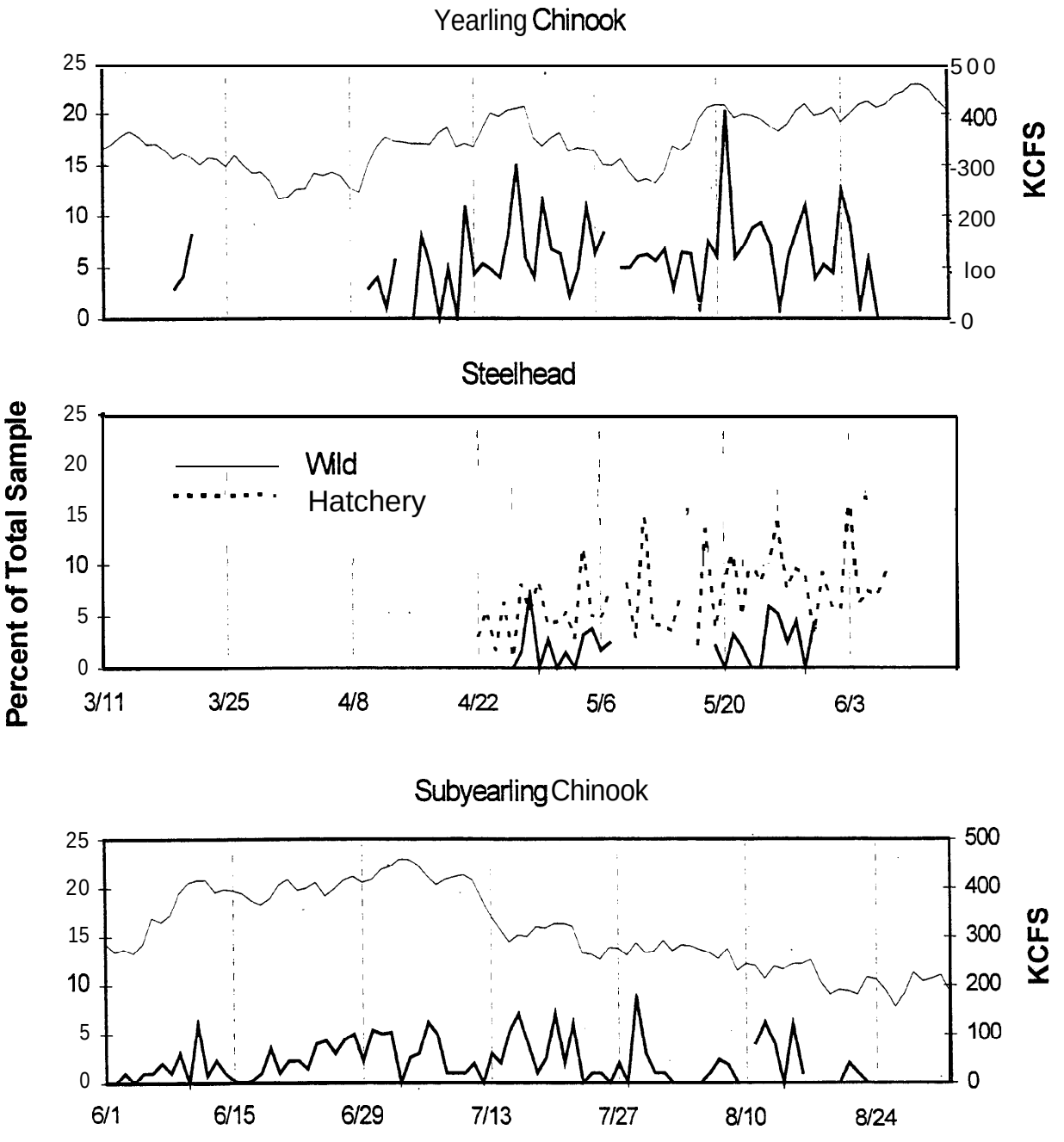


Figure B-2. Daily percent descaling and river flow at Bonneville Dam, 1996. Days with sample size less than 30 excluded.

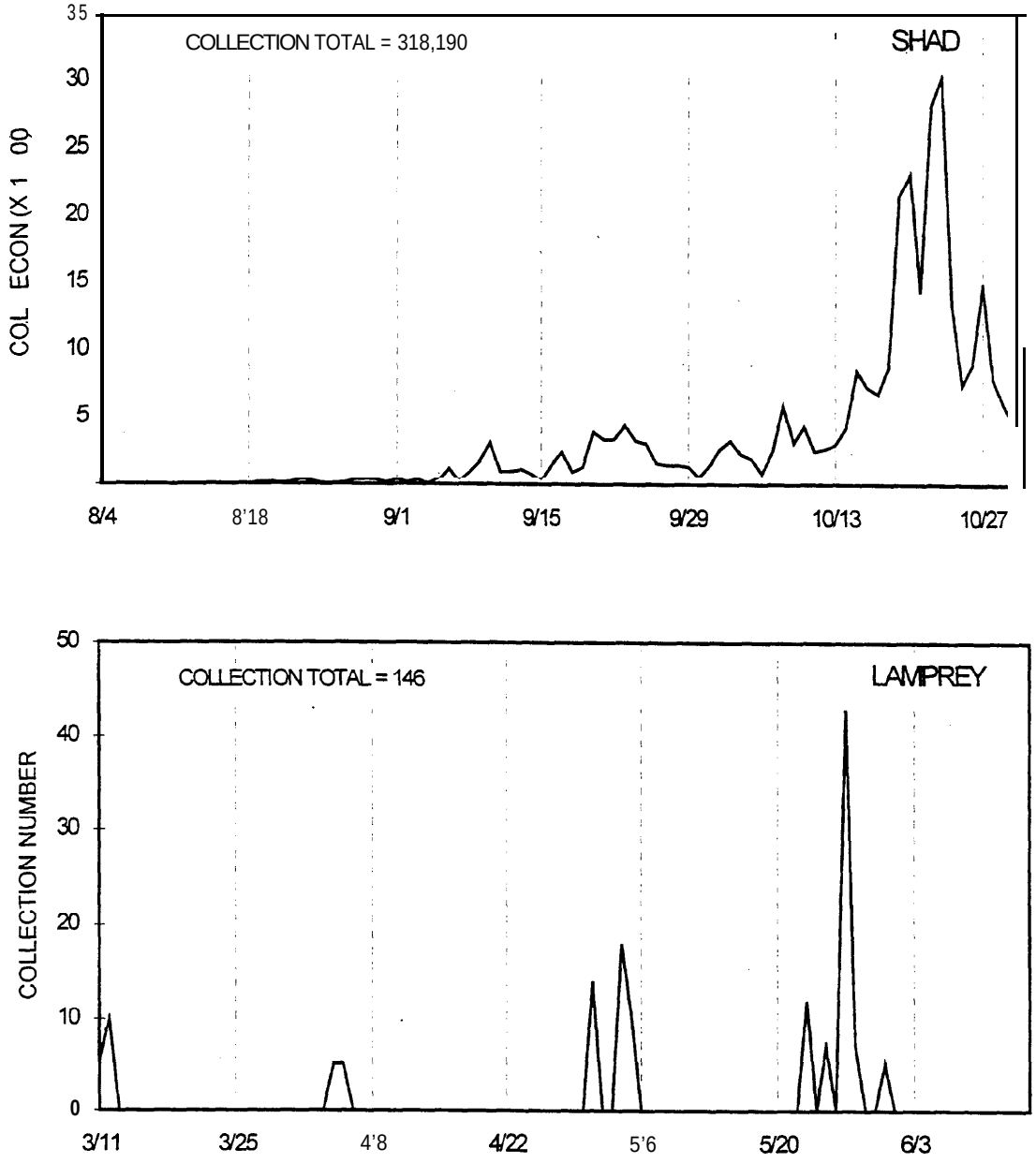


Figure B-3. Seasonal juvenile shad and lamprey counts at Bonneville Dam, 1996.

Table B-I. Observations of PIT tagged fish at Bonneville Dam during 1996.

RELEASE SITE	SPECIES	RUN	REARING TYPE	N	MEAN	MIN	MAX	RIVER KM UPSTREAM OF BONN	AVERAGE SPEED KM/DAY
Big Canvon Creek	Steelhead	Summer	Wild	5	14.6	7.9	26.5	589	39.0
Big Canyon Facility	Steelhead	Summer	Hatchery	25	28.1	14 1	40.6	709	25.21
Catherine Creek	Chinook	Spring	Wlld	6	83.0	62.2	145.6	791	9.5
Chiwawa Reanna Pond	Chinook	Spnng	Hatchery	4	37.6	35.0	42.4	600	15.9
Clear Creek -	Chinook	Spring	Hatchery	276	40.8	17.2	55.9	636	15.6
	Steelhead	Summer	Hatchery	7	25.3	17.6	34.5	636	25.1
Clearwater Hatchery	Steelhead	Summer	Hatchery	8	43.8	34.2	54.7	N/A	N/A
Clearwater River NF	Chinook	Spring	Hatchery	56	44.0	29.1	56.6	577	13.1
Clearwater River SF	Stealhead	Summer	Hatchery	20	25.2	15.3	40.7	632	25.1
Crooked Fork Creek Trap	Steelhead	Summer	Wrld	4	12.3	11.3	13.2	785	64.1
Crooked River	Steelhead	Summer	Hatchery	16	39.9	29.5	52.8	726	18.2
Crooked River P	Chinook	Spring	Hatchery	21	48.9	38.3	70.1	741	15.8
Crooked River Trap	Steelhead	Summer	Hatchery	9	36.6	31 1	47.8	727	19.9
Curl Lake Raering Pond	Steelhead	Summer	Hatchery	27	442	'18.5	62.8	467	10.6
Deschutes Rover	Chinook	Spring	Hatchery	24	9.9	4.1	19.4	94	9.5
Dryden Acclimation Pond	Chinwk	Summer	Hatchery	9	19.3	107	40.5	546	28.2
Dworshak Hatchery	Stealhead	Summer	Hatchery	87	22.1	13.6	445	577	26.1
Entiat Hatchery	Chinook	Spring	Hatchery	5	46.8	36.3	51.1	561	12.0
Grand Ronde River	Chinook	Spring	Wild	4	69.3	25.9	103.2	559	8.1
	Steelhead	Summer	Hatchery	8	14.9	10.5	22.0	559	37.5
Hazard Creek	Steelhead	Summer	Hatchet-y	6	46.9	38.3	56.4	762	16.2
Heels Canyon Dam	Steelhead	Summer	Hatchery	4	53.4	51.6	56.6	685	12.8
Herd Creek	Steelhead	Summer	Hatchery	10	33.4	28.5	44.1	1157	34.7
Imnaha River W	Chinook	Spring	Hatchery	41	49.2	39.8	59.3	603	12.3
Imnaha Trap	Chinook	Summer	Hatchery	9	31.7	20.2	49.5	603	19.0
	Chinook	Summer	Wild	21	29.3	15.0	74.6	603	20.6
	Steelhead	Summer	Hatchery	24	20.9	12.4	29.8	603	28.8
	Steelhead	Summer	Wild	43	14.4	8.5	20.5	60	4.2
Knox Bridge	Chinook	Summer	Hatchery	218	48.0	31.6	71.2	918	19.1
Leavenworth Hatchery	Chinook	Spnng	Hatchery	6	36.3	33.7	37.9	566	15.6
Lemhi River	Steelhead	Summer	Hatchery	14	32.7	244	39.4	1007	30.8
Little Goose Forebay	Steelhead	Spnng	Hatchery	18	8.7	6.5	13.4	401	46.3
	Steelhead	Summer	Hatchery	49	8.9	5.3	18.2	401	44.9
Little Salmon River	Steelhead	Summer	Hatchery	25	48.3	17.0	76.5	591	12.2
Little Sheep Facility	Steelhead	Summer	Hatchery	44	28.4	22.4	43.5	641	22.6
Lookingglass Hatchery	Chinook	Spring	Hatchery	56	41.2	25.1	51.3	696	16.9
Lower Granite BR	Chinook	Unknown	Hatchery	5	19.0	10.2	27.6	461	24.3
Lower Granite Dam RR	Chinook	Unknown	Hatchery	925	16.9	8.1	45.8	461	27.4
	Chinook	Unknown	Unknown	177	16.5	9.2	29.4	461	27.9
	Chinook	Unknown	Unknown	144	17.6	9.2	38.8	461	26.2
Lower Granite Forebay	Steelhead	Summer	Hatchet-y	203	17.1	7.3	35.4	461	26.9
Lower Granite Tailrace	Staelhead	Summer	Hatchery	185	16.4	7.3	38.6	461	28.0
Lyons Ferry Hatchery	Chinook	Fall	Hatchery	18	22.9	12.5	36.8	383	16.8
	Staelhead	Summer	Hatchery		24.4	13.3	35.0	383	15.7
Pahsimeroi River Trap	Steelhaad	Summer	Hatchery	5:	24.8	11.6	44.6	1082	43.7
Powell Rearing Pond	Chinook	Spnng	Hatchery	107	45.7	252	63.2	782	17.1
Priest Rapids Hatchery	Chinook	Fall	Hatchery	10	24.8	8.6	36.6	405	16.3
Rapid River Hatchery	Chinwk	Spnng	Hatchery	182	61.8	39.3	79.0	744	12.0
Red River	Steelhead	Summer	Hatchery	44	46.3	24.6	55.8	733	18.2
Red River Rearina Pond	Chinook	Spring	Hatchery	5	51.1	45.9	57.8	760	14.9
Redfish Lake Creek Trap	Sockeye	Summer	Hatchery	8	24.7	19.2	35.3	1209	48.9
Rock Island Dam	Chinwk	Unknown	Hatchery	44	14.5	6.3	28.5	496	34.2
	Chinwk	Unknown	Unknown	42	18.7	9.1	60.5	496	26.6
	Steelhead	Summer	Hatchery	115	11.1	6.3	28.6	496	44.7
	Steelhead	Summer	Wrld	51	9.7	6.8	25.3	496	51.3
	Sockeye	Unknown	Hatchery	23	13.9	6.6	24.0	496	35.6
	Sockeye	Unknown	Wild	16	186	7.6	63.1	496	26.7
Salmon River	Steelhead	Summer	Hatchery	46	34.5	22.8	55.4	591	17.2
Salmon River NF	Steelhead	Summer	Hatchery	10	36.5	26.9	43.5	972	26.6
Salmon River Trap	Chinook	Unknown	Hatchery	21	38.7	23.9	50.4	676	17.5
	Chinook	Unknown	Wrld	22	39.6	19.3	67.4	676	17.1
	Steelhead	Summer	Hatchery	40	20.4	9.7	37.1	676	33.1
	Steelhead	Summer	Wtld	7	12.2	8.5	22.9	676	55.3
Sawtooth Hatchery	Steelhead	Summer	Hatchery	30	24.5	12.5	43.2	1208	49.2
Sawtooth Trap	Steelhead	Summer	Hatchery	28	35.0	17.2	58.6	1208	34.5
Similkameen P/H	Chinwk	Summer	Hatchery	23	42.1	26.4	62.1	836	19.9
Snake River	Chinook	Fall	Hatchery	98	33.9	14.1	118.0	288	8.5
	Chinook	Unknown	Hatchery	40	33.6	14.0	49.8	288	8.6
	Stealhead	Summer	Hatchery	271	17.9	8.6	444	288	16.1
Snake River Trap	Chinook	Unknown	Hatchery	22	27.9	16.2	42.0	513	18.4
	Chinook	Unknown	Wfd	13	21 5	12.5	30.4	513	23.9
	Steelhead	Summer	Hatchery	51	17.7	9.7	40.4	513	28.9
	Steelhead	Summer	Wild	29	11.0	7.5	25.8	513	46.6
Tucannon River Hatchery	Chinwk	Spring	Hatchery	4	59.9	51.3	74.2	457	7.6
Wells Hatchery	Chinook	Summer	Hatchery	13	33.5	20.5	51.7	595	17.8
Winthrop Hatchery	Chmwk	Spring	Hatchery	18	43.8	36.5	49.2	690	15.8
			TOTAL	4357					

Observations of PIT Tagged fish at Bonneville Dam released pnor to 1986.

RELEASE SITE	SPECIES	RUN	REARING TYPE	TRAVEL TIME (DAYS) N	MEAN	MIN	MAX	RIVER KM UPSTREAM OF BON	AVERAGE SPEED KM/DAY
Catherine Creek	Chinook	Spring	Wild	4	193.0	163.9	206.5	791	4.1
Crooked Fork Creek Trap	Steelhead	Summer	Wrld	20	465.3	239.2	735.2	785	1.7
Fish Creek	Steelhead	Summer	Wild		4680	260.6	631.7	708	1.5
Fish Creek Trap	Steelhead	Summer	Wild	13	270.3	231.7	345.8	810	3.0
Imnaha River W	Chinook	Summer	Wild	6	2103	192.9	220.1	670	3.2
Looking Glass Creak	Chinook	Spring	Wild	12	213.2	179.8	243.6	732	3.3
Lostine River	Chinook	Spring	Wild	7	282.3	270.9	306.7	584	2.6
Orofino Creek	Coho	Fall	Hatchery	9	321.2	307.5	335.5		1.8
Rapid River Hatchery	Steelhead	Summer	Wild	4	221.2	222.4	246.7	744	3.4
Salmon River SF Tray	Chinook	Summer	Wild	4	232.8	202.3	241.1	917	3.9
Sawtooth Trap	Chinook	Spring	Wild	4	225.3		255.1	513	2.3
Snake River	Chinook	Fall	Hatchery	5	327.8	304.9	349.5	288	0.9
			TOTAL	93					

Note: Release sites with N<4 observations were excluded from thii table except for sockeye.

Table u-z. Summary of PIT tag detections at Bonneville Dam PH 1 tunnel, 1996.

Species	Run	Rearing Type	Diverter Coil	Recapture Station	Recapture Efficiency (%)
Chinook	Spring	Hatchery	22	21	95.5
		Wild	2	1	50.0
	Summer	Hatchery	13	11	84.6
		Wild	1	1	100.0
	Fall	Hatchery	12	6	50.0
		Wild	0	0	0.0
	Unknown	Hatchery	27	36	133.3
		Wild	a	12	150.0
		Unknown	10	0	0.0
	Chinook Total		95	88	92.6
Coho	Fall	Hatchery	2	2	100.0
		Wild	0	0	0.0
	Coho Total		2	2	100.0
Steelhead	Summer	Hatchery	64	60	93.8
		Wild	11	7	63.6
	Steelhead Total		75	67	89.3
Sockeye	Summer	Hatchery	1	0	0.0
		Wild	0	0	0.0
	Sockeye Total		1	0	0.0
Totals - All Species Combined			173	157	90.a

Table B-3. Brand recoveries in 1996 at Bonneville Dam, PH-1.

Release Site	Brand	# Recap	# Released	Sample Rate	Recaptured Collected #	Recaptured Collected %	Index #	Index %	Rel. Date	Recapture Range	Median Date
					YEARLING CHINOOK						
meques											
	LA-B-1	2	5,083	0.04	23	0.45	146	2.87	3/13	4/27-4/30	4/30
	LA-B-2	2	2,026	0.1	15	0.74	89	4.39	3/13	4/06-4/20	4/20
	LA-B-3	4	4,232	0.09	36	0.85	224	5.29	3/13	4/16-5/01	4/28
	LA-B-4	3	4,682	0.06	Ia	0.38	119	2.54	3/13	4/01-4/27	4/27
	RA-B-2	2	4,531	0.04	16	0.35	95	2.1	3/13	4/13-5/09	5/09
	RA-B-3	2	5,092	0.04	15	0.29	99	1.94	3/13	4/15-4/28	4/28
	RA-B-4	1	5,275	0.02	5	0.09	24	0.45	3/13	4/15-4/28	4/28
Below LGR Dam											
	LA-F-3	5	7,506	0.07	55	0.73	283	3.77	5/11-5/13	5/22-5/28	5/28
	LA-F4	4	7,537	0.05	25	0.33	149	1.98	5/13-5/16	5/26-5/30	5/30
	LA-L-2	1	5.111	0.02	10	0.2	49	0.96	4/18	5/07	5/07
	LA-PI-1	4	7,959	0.05	65	0.82	367	4.61	4/09-4/21	4/29-5/05	5/02
	LA-PI-2	6	7,534	0.08	84	1.11	450	5.97	4/21-4/25	5/01-5/20	5/05
	LA-PI-3	5	7.613	0.07	92	1.21	455	5.98	4/25-4/29	5/09-5/17	5/15
	LA-PI-4	2	7,509	0.03	25	0.33	128	1.7	4/29-5/03	5/21-5/24	5/21
	LA-PP-1	6	7,508	0.08	63	0.84	357	4.75	5/03-5/06	4/27-5/27	5/20
	LA-P P-2	3	7,913	0.04	29	0.37	139	1.76	5/06-5/11	5/23-5/28	5/24
	LA-RT-1	3	7,495	0.04	17	0.23	98	1.31	5/16-5/28	6/01-6/03	6/02
					SUBYEARLING CHINOOK						
Imeques											
	LA-E-3	7	9,980	0.07	38	0.38	231	2.31	5/30	6/11-6/21	6/13
	LA-E4	3	10,389	0.03	15	0.14	74	0.71	5/30	6/19-6/23	6/22
	RA-E-3	6	10,237	0.06	35	0.34	222	2.17	5/30	6/10-6/18	6/14
	RA-E-4	2	9,965	0.02	11	0.11	55	0.55	5/30	6/15-6/23	6/15
	LA-5-3	4	10,420	0.04	25	0.24	133	1.28	5/30	6/11-7/01	6113
	LA-54	2	9,407	0.02	12	0.13	74	0.79	5/30	6/14-6/15	6/14
	RA-5-3	4	10,252	0.04	22	0.21	141	1.38	5130	6/09-6/21	6/10
	RA-5-4	5	10,577	0.05	27	0.26	166	1.57	5/30	6/11-6/19	6/11
Thornhollow											
	LA-5-2	2	10,378	0.02	11	0.11	66	0.64	5/31	6/15	6/15
	RA-5-2	9	10,316	0.09	50	0.48	299	2.9	5/31	6/12-6/21	6/15
					STEELHEAD						
Wallowa											
	LA-A- 1	5	19,280	0.03	119	0.62	620	3.22	4/09-4/23	4/27-5/18	5/16
Little Sheep											
	RA-A-2		17.993	0.01	20	0.11	122	0.68	4/29	5/20	5/20
Lyons Ferry											
	LA-IT-1	2	19,861	0.01	19	0.1	88	0.44	4/18-4/19	5/05-5/13	5/05
	LA-IT-3	5	19,095	0.03	99	0.52	78	0.41	4118-4/19	5/01-5/21	511 a
	RA-IT-1	2	19,972	0.01	24	0.12	117	0.59	4/18-4/19	5/05-5/15	5/15
	LA-IV-1	10	38,728	0.03	143	0.37	770	1.99	3/27-5/02	5/03-5/27	5/14
	LA-IV-3	a	38,253	0.02	88	0.23	461	1.21	3/27-5/02	5/03-5/27	5/05
	RA-IV-1	4	29,625	0.01	42	0.14	204	0.69	4/15	5/05-5/13	5/09
Bonifer											
	RA-L-2	22	8,827	0.25	28	0.32	172	1.95	4/24-4/26	4/27-5/02	5/02
					COHO						
Non-Hatchery											
	LA-+T-3	1	100	1	10	10	52	52	4/25	5/10	5/10
	TOTAL	159									

'able B-4. Brand recoveries in 1996 at Bonneville Dam, PH-2.

Release Site	Brand	#Recap	#Released	Recaptured Sample Rate	Colt. #	Colt. %	Ret. Date	Recapture Range
			YEARLING CHINOOK					
meques								
	LA-B-1	1	5,083	0.02	10	0.2	3/13	4/20
	LA-B-2	7	5,026	0.14	70	1.39	3/13	4/11-5/04
	IA-B-3	5	4,232	0.12	50	1.18	3/13	4/06-5/11
	LA-B-4	5	4,682	0.11	50	1.07	3/13	4/16-4/17
	RA-B-2	6	4,531	0.13	60	1.32	3/13	4/06-5/11
	RA-B-3	1	5,092	0.02	10	0.2	3/13	4/09
	RA-B-4	3	5,275	0.06	10	0.19	3/13	4/06
	LA-L-2	1	5,111	0.02	10	0.2	4/18	5/06
	RA-L-2	2	5,218	0.04	20	0.38	4/18	
Non-Hatchery								
	LA-F-3	1	7,506	0.01	10	0.13	5/11-5/13	5/22
	LA-F-4	2	7,537	0.03	20	0.27	5/13-5/16	5/25
	LA-PI-1	1	7,659	0.01	10	0.13	4/09-4/21	4/29
	LA-Pi-3	1	7,613	0.01	10	0.13	4/25-4/29	5/06
	LA-RT-1	2	7,459	0.03	20	0.27	5/16-2/28	6/05-6/10
			SUBYEARLING CHINOOK					
Imeques								
	LA-E-3	1	9,980	0.01	10	0.1	5/30	6/10
	LA-E-4	1	10,389	0.01	10	0.1	5/30	6/17
	RA-E-3	2	10,237	0.02	20	0.2	5/30	6/12-6/22
	LA-5-3	1	10,420	0.01	20	0.19	5/30	6/22
	RA-5-3	1	10,252	0.01	10	0.1	5/30	6/24
	RA-5-4	1	10,557	0.01	10	0.09	5/30	6/19
Thornhollow								
	LA-5-2	2	10,378	0.02	20	0.19	5/31	6/12-6/17
	RA-5-2	3	10,316	0.03	30	0.29	5/31	6/10-6/17
			STEELHEAD					
Lyons Ferry								
	LA-IT-1	1	19,861	0.01	10	0.05	4/18-4/19	5/07
	LA-IT-3	1	19,095	0.01	10	0.05	4/18-4/19	5/04
	RA-IT-1	1	19,972	0.01	10	0.05	4/18-4/19	5/14
	LA-IV-3	1	38,253	0	10	0.03	4/18-4/19	5/04
	TOTAL	54						

Table B-5. PH-1 sampling interruptions at Bonneville Dam, 1996.

Date	Reason for Outage	Hours Missed
March 11	Testing new trap and flat plate	2
May 8	Trash sweep repair	8
May 14	Fiat plate repair	1
June 26	Trap guide repair	1
August 10	Trap door repair	1
August 28	Trap guide repair	1
September 4	Flat plate testing	8
September 14	Broken air line repair	1
	Total hours missed	23

APPENDIX C
HISTORICAL DATA

JOHN DAY DAM

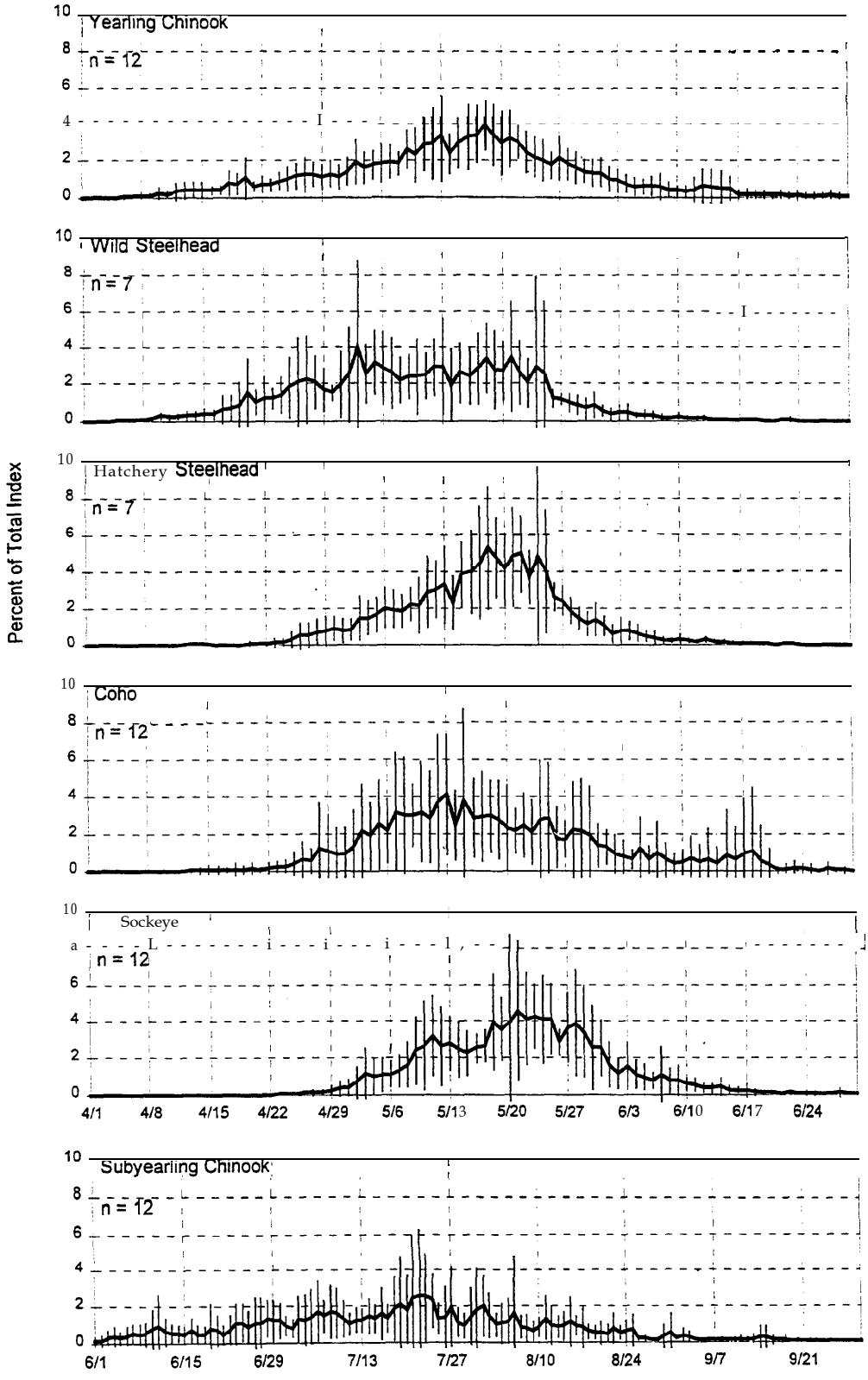


Figure C-l. Historical average passage pattern with standard deviation, John Day Dam, 1985- 1996.

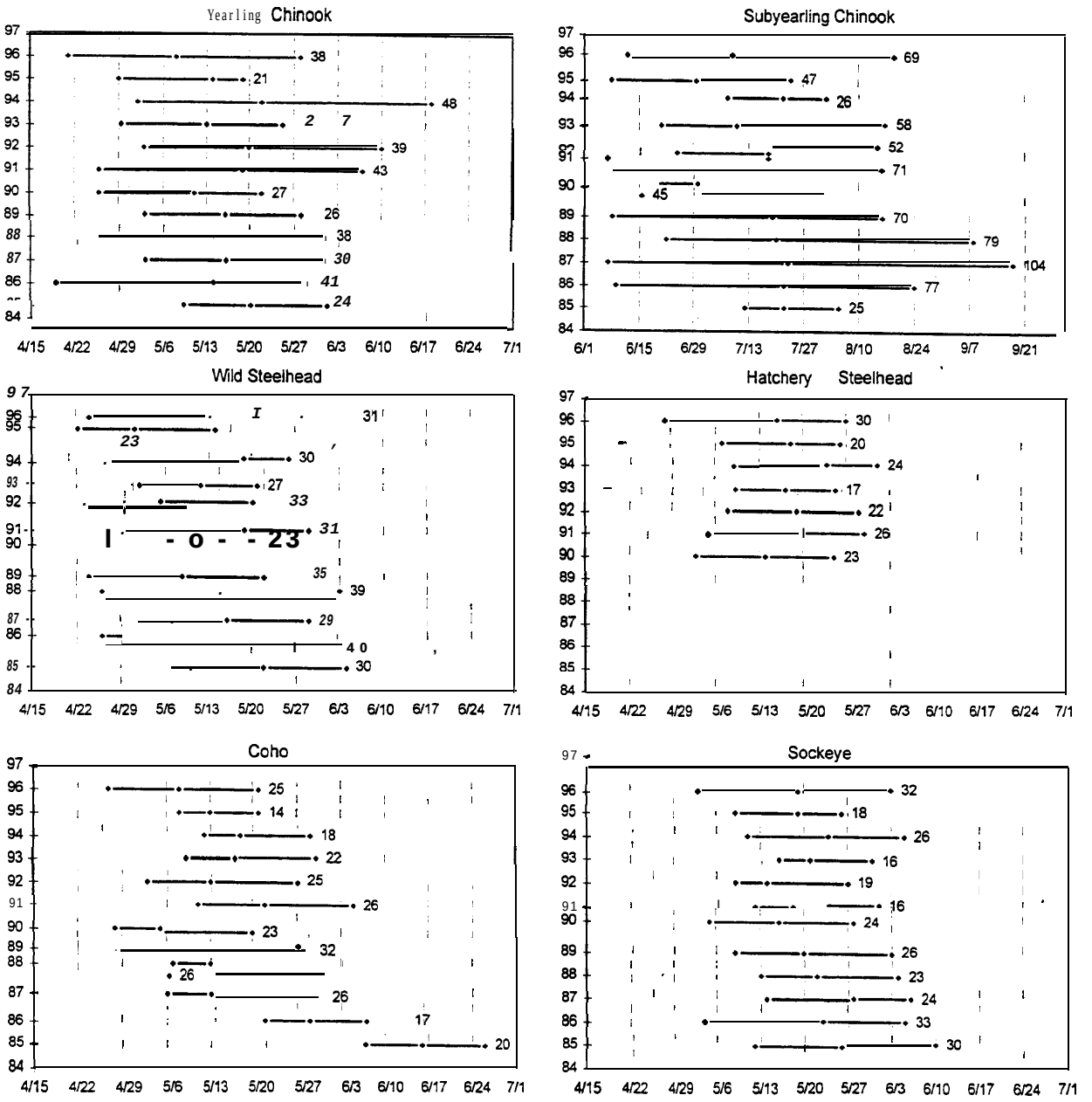


Figure C-2. 10%, 50%, and 90% passage dates for each season at John Day Dam, by species, 1985-1996. The duration between 10-90% dates (in days) is indicated for each line. Hatchery and wild steelhead were not differentiated before **1990.**

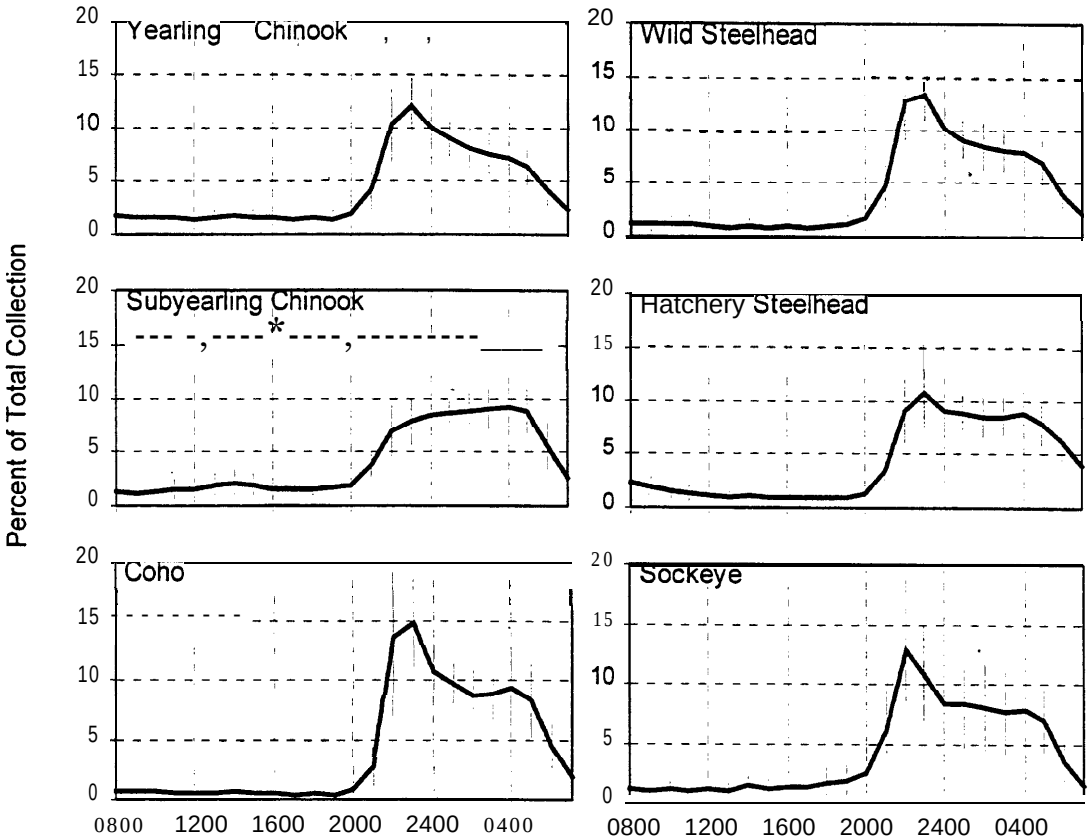


Figure C-3. Historical average diel passage with standard deviation, John Day Dam, 1985- 1996.

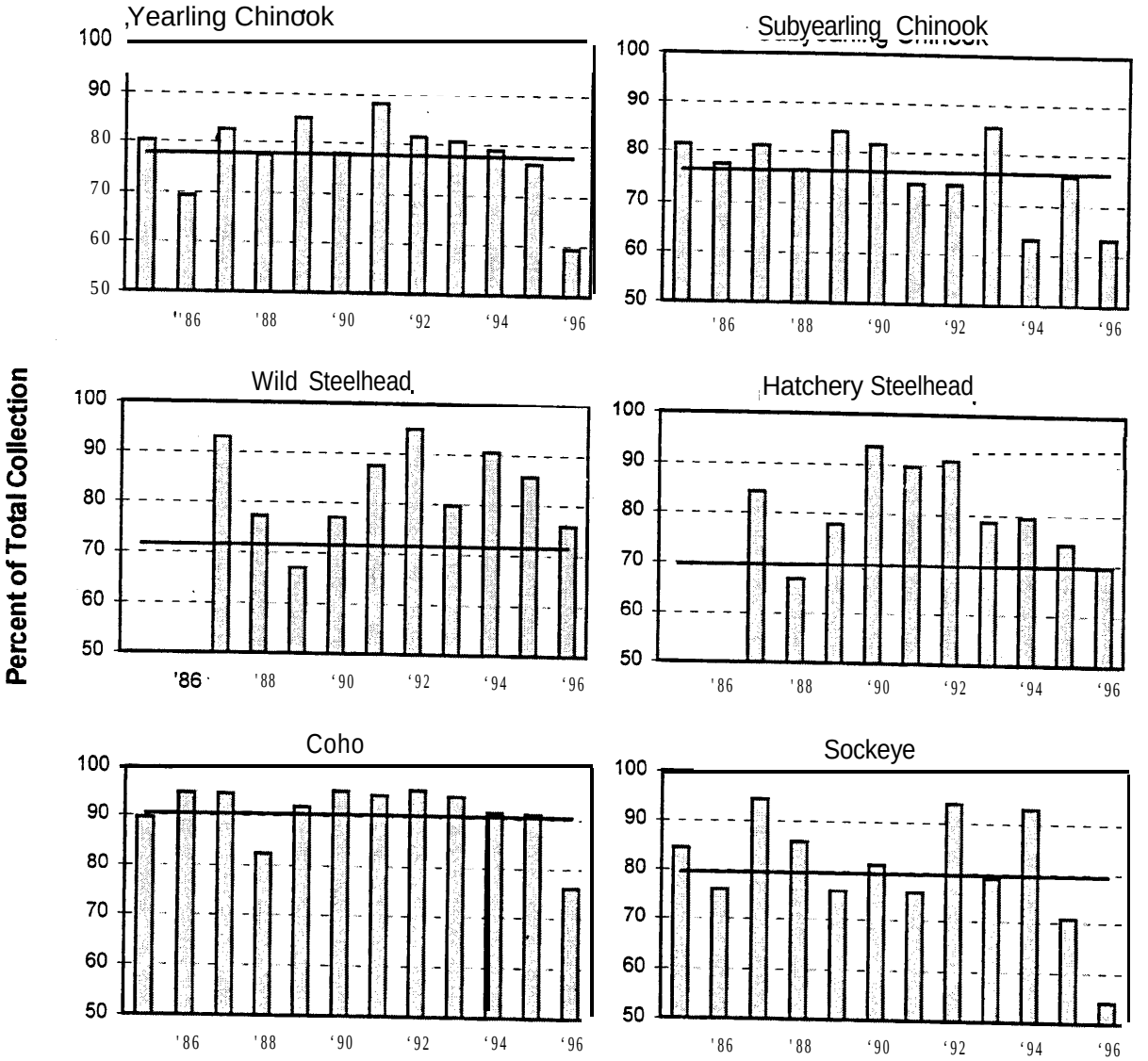


Figure C-4. Percent night passage (2000-0600) for each season at John Day Dam, by species, including the averaae for all years. 1985-1996.

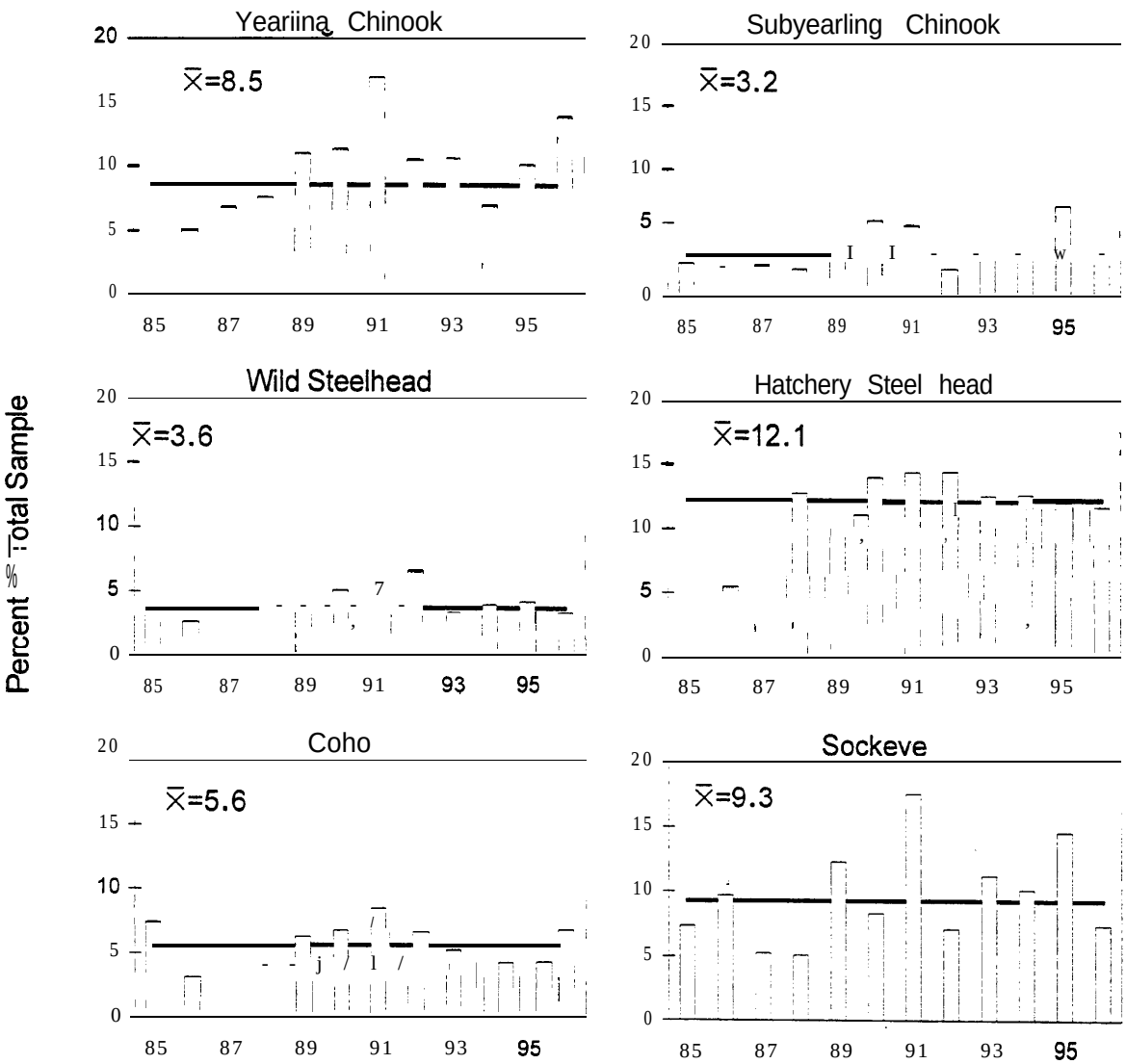


Figure C-5. Historical descaling percentages with the average, John Day Dam, 1985-1 996. Hatchery and wild steelhead not differentiated before 1987.

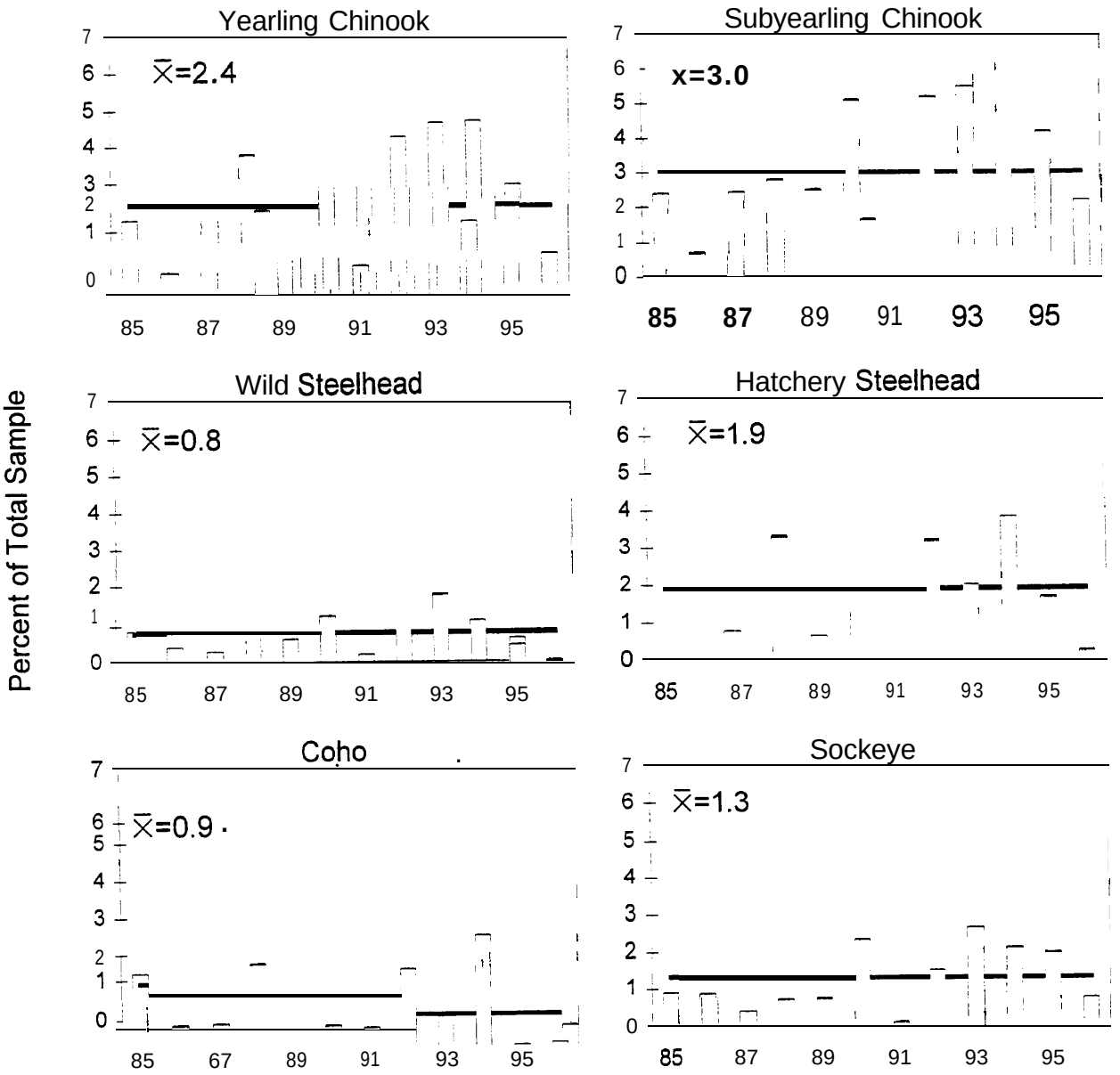


Figure C-6. Historical mortality percentages with the average, JohnDay Dam, 1985-1996. Hatchery and wild steelhead not differentiated before 1987.

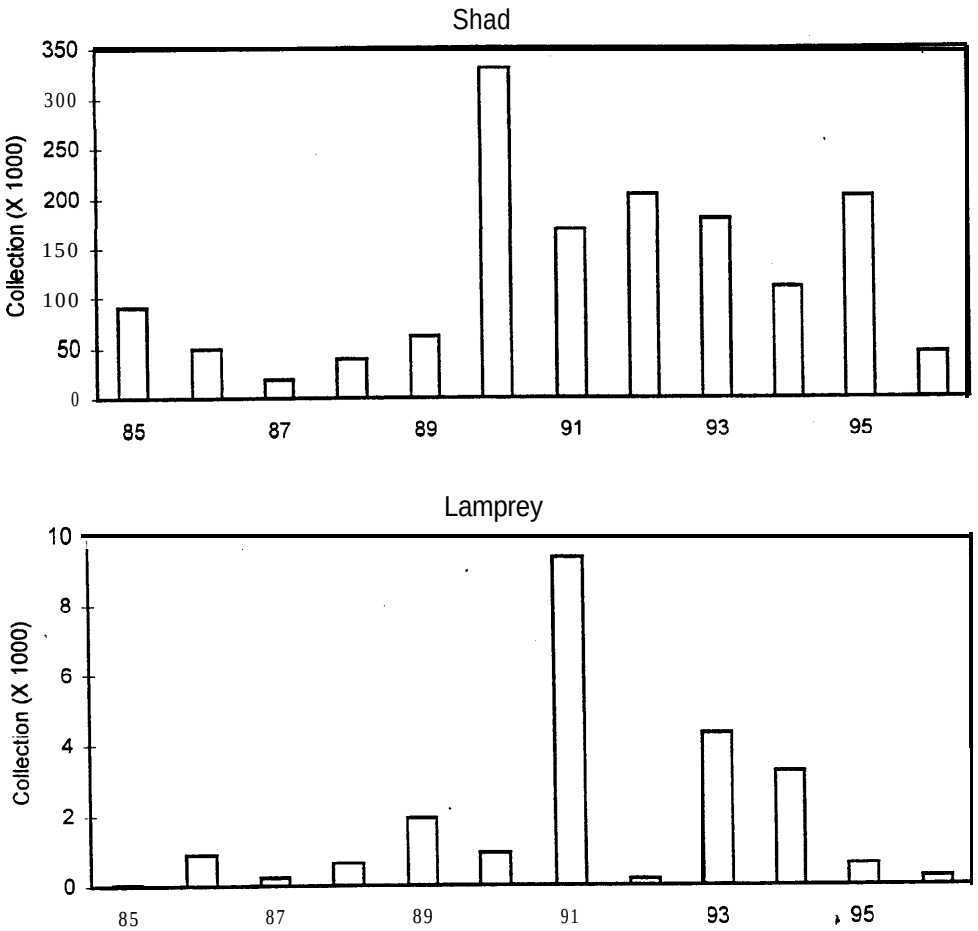


Figure C-7. Historical juvenile shad and lamprey counts at John Day Dam, 1985-1996.

Table C-l. 10, 50, 90 percent passage dates at John Day Dam based on the RSDEP "daily" index

Yearling Chinook

	10 %	50%	90 %	# of Days
1996	21-Apr	8-May	28-May	38
1995	29-Apr	14-May	19-May	21
1994	2-May	22-May	18-Jun	48
1993	6-May	20-May	1-Jun	27
1992	3-May	20-May	1 0-Jun	39
1991	26-Apr	19-May	7-J un	43
1990"	26-Apr	11-May	22-May	27
1989	3-May	16-May	28-May	26
1988	25-Apr	14-May	1-Jun	38
1987	3-May	16-May	1-Jun	30
1986	19-Apr	14-May	29-May	41
1985 ^	9-May	20-May	1-Jun	24
MEDIAN	30-Apr	16-May	1-Jun	34
MIN	19-Apr	11-May	19-May	31
MAX	6-May	22-May	18-Jun	44

Subyearling Chinook

	10 %	50%	90 %	# of Days
1996	12-Jun	9-Jul	19-Aug	69
1995	8-Jun	30-Jun	24-Jul	47
1994	8-Jul	22-Jul	2-Aug	26
1993	21-Jun	10-Jul	17-Aug	58
1992	25-Jun	18-Jul	15-Aug	52
1991	7-Jun	18-Jul	16-Aug	71
1990 ^	19-Jun	30-Jun	2-Aug	45
1989	8-Jun	19-Jul	16-Aug	70
1988	22-Jun	20-Jul	8-Sep	79
1987	7-Jun	23-Jul	18-Sep	104
1986	9-Jun	22-Jul	24-Aug	77
1985 ^	12-Jul	22-Jul	5-Aug	25
MEDIAN	15-Jun	18-Jul	16-Aug	64
MIN	7-Jun	30-Jun	24-Jul	48
MAX	8-Jul	23-Jul	18-Sep	73

Wild Steelhead

	10%	50%	90 %	# of Days
1996	24-Apr	13-May	24-May	31
1995	3-May	12-May	25-May	23
1994	27-Apr	19-May	26-May	30
1993	30-Apr	17-May	26-May	27
1992	23-Apr	10-May	25-May	33
1991	29-Apr	19-May	29-May	31
1990 ^	26-Apr	4-May	18-May	23
1989*	24-Apr	15-May	28-May	35
1988*	26-Apr	15-May	3-Jun	39
1987*	1-May	16-May	29-May	29
1986*	26-Apr	18-May	4-Jun	40
1985*^	6-May	22-May	4-Jun	30
MEDIAN	27-Apr	13-May	25-May	30
MIN	23-Apr	10-May	25-May	33
MAX	3-May	19-May	29-May	27
	WILD FISH ONLY, N = 6			

Fatchery Steelhead

	10 %	50%	90 %	# of Days
1996	28-Apr	16-May	27-May	30
1995	7-May	18-May	26-May	20
1994	9-May	24-May	1-Jun	24
1993	10-May	18-May	26-May	17
1992	8-May	19-May	29-May	22
1991	5-May	20-May	30-May	26
1990 ^	3-May	14-May	25-May	23
1989*	ALL STEELHEAD IN WILD			
1988'	ALL STEELHEAD IN WILD			
1987*	ALL STEELHEAD IN WILD			
1986*	ALL STEELHEAD IN WILD			
1985*^	ALL STEELHEAD IN WILD			
MEDIAN	7-May	18-May	27-May	23
MIN	3-May	14-May	25-May	23
MAX	10-May	24-May	1-Jun	23
	HATCHERY FISH ONLY, N = 6			

Coho

	10 %	50%	90 %	# of Days
1996	27-Apr	8-May	2 1-May	25
1995	8-May	13-May	2 1-May	14
1994	12-May	18-May	29-May	18
1993	9-May	17-May	30-May	22
1992	3-May	13-May	27-May	25
1991	11 -May	22-May	5-Jun	26
1990 ^	28-Apr	5-May	20-May	23
1989	28-Apr	13-May	29-May	32
1988	7-May	13-May	1-Jun	26
1987	6-May	13-May	31 -May	26
1986	22-May	29-May	7-Jun	17
1985 ^	7-Jun	16-Jun	26-J un	20
MEDIAN	7-May	13-May	29-May	24
MIN	28-Apr	5-May	20-May	14
MAX	7-Jun	16-Jun	26-Jun	32

Sockeye (Wild + Hatchery)

	10%	50%	90 %	# of Days
1996	3-May	19-May	3-Jun	32
1995	9-May	19-May	26-May	18
1994	11 -May	24-May	5-Jun	26
1993	16-May	21-May	31 -May	16
1992	9-May	14-May	27-May	19
1991	17-May	23-May	1-Jun	16
1990 ^	5-May	16-May	28-May	24
1989	9-May	20-May	3-Jun	26
1988	13-May	22-May	4-Jun	23
1987	14-May	28-May	6-Jun	24
1986	4-May	23-May	5-Jun	33
1985 ^	12-May	26-May	1 0-J un	30
MEDIAN	10-May	21-May	3-Jun	24
MIN	4-May	14-May	26-May	16
MAX	17-May	28-May	10-Jun	33

* Years in wich no differentiation was made between wild and hatchery steelh d for index purposes.

^ Years in which the sample unit was out of service (1990: May 30 - June 9, and 1985: April 2 to April 26)

Table C-2. Percent night passage (2000-0600) for each season at John Day Dam, 1985-1996.

YEAR	Yearling Chinook	Subyearling Chinook	Wild Steel head	Hatchery Steel head	Coho	Sockeye
1996	59.4	63.3	75.8	69.6	76.1	54.1
1995	76.2	75.8	85.6	74.3	91.0	70.8
1994	78.8	63.2	90.5	79.5	91.2	93.0
1993	80.7	85.6	79.8	78.6	94.4	79.0
1992	81.5	73.9	94.9	90.9	95.6	93.9
1991	88.0	74.0	87.6	89.7	94.5	75.7
1990	77.7	81.8	77.1	93.6	95.3	81.3
1989	84.9	84.3	67.0	77.7	91.9	75.9
1988	77.3	76.4	77.3	66.7	82.5	85.8
1987	82.5	81.3	92.9	84.2	94.6	94.4
1986	69.4	77.4	N/A	NIP	94.8	76.1
1985	80.2	81.5	N/A	NIP	89.6	84.5
MEDIAN	79.5	76.9	82.7	79.1	93.2	80.2
MIN	59.4	63.2	67.0	66.7	76.1	54.1
MAX	88.0	85.6	94.9	93.6	95.6	94.4

TABLE C-3. Descaling and mortality data from John Day Dam, 1985 - 1996.

	CHINOOK 1					CHINOOK 0				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1985	62,790	3,846	6.2	809	1.3	228,211	4,567	2.0	5,425	2.4
1986	92,856	4.630	5.0	547	0.6	181,857	4,135	2.3	1,231	0.7
1987	84,312	5,617	6.8	1,505	1.8	95,693	2,290	2.5	2,313	2.4
1988	34,071	2,470	7.5	1,292	3.8	109,435	2,186	2.1	3,050	2.8
1989	34,935	3,749	10.9	694	2.0	129,957	5,922	4.7	3,273	2.5
1990	26,907	2,968	11.3	541	2.0	39,280	2,316	6.2	2,009	5.1
1991	26,879	4,487	16.9	320	1.2	46,785	2,696	5.9	775	1.7
1992	42,231	4,256	10.5	1,823	4.3	59,783	1,216	2.1	3,096	5.2
1993	52,821	5,342	10.6	2,464	4.7	116,804	3,954	3.6	6,413	5.5
1994	34,071	2,219	6.8	1,606	4.7	75,164	2,309	3.3	5,004	6.7
1995	34,308	3,361	10.1	1,032	3.0	48,896	3,325	7.1	2,029	4.2
1996	14,560	2,001	13.9	158	1.1	31,157	1.119	3.7	692	2.2
TOTAL	540,741	44,946	8.5	12,791	2.4	1,163,022	36,035	3.2	35,310	3.0

	WILD STEELHEAD					HATCHERY STEELHEAD				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1.985	36,355	1,292	3.6	320	0.9					
1986	37,858	962	2.6	156	0.4					
1987	12,374	447	3.6	41	0.3	11,622	634	5.5	94	0.8
1988	6,810	335	5.0	56	0.8	8,227	1,012	12.7	26%	3.3
1989	8,585	348	4.1	53	0.6	11,229	1.225	11.0	84	0.7
1990	6,104	303	5.0	76	1.2	4,867	665	13.9	90	1.8
1991	5,455	287	5.3	10	0.2	11,171	1,593	14.3	30	0.3
1992	5,141	332	6.5	54	1.1	11,970	1,663	14.4	389	3.2
1993	16,042	530	3.4	294	1.8	52,936	6,562	12.6	1,049	2.0
1994	7,604	290	3.9	85	1.1	14.454	1,761	12.7	554	3.8
1995	4,043	166	4.1	26	0.6	18,915	2,236	12.0	325	1.7
1996	3,973	134	3.4	3	0.1	11,171	1,310	11.B	30	0.3
TOTAL	150,344	5,426	3.6	1,174	0.8	156,562	18,661	12.1	2,913	1.9

	COHO					SOCKEYE				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1985	598	44	7.4	7	1.2	17.246	1,258	7.4	157	0.9
1986	1,990	62	3.1	4	0.2	17,539	1,688	9.7	151	0.9
1987	13,213	741	5.6	36	0.3	11,923	624	5.3	48	0.4
1988	8,680	363	4.3	153	1.8	6,336	320	5.1	45	0.7
1989	6,934	431	6.2	12	0.2	5,497	672	12.3	41	0.7
1990	6,261	418	6.7	7	0.1	1,769	144	8.3	41	2.3
1991	5,104	437	8.6	3	0.1	3,447	604	17.5	4	0.1
1992	9,804	636	6.6	158	1.6	2,608	183	7.1	39	1.5
1993	13,164	669	5.1	110	0.8	14,885	1,630	11.3	397	2.7
1994	11,385	446	4.0	281	2.5	7,270	719	10.1	155	2.1
1995	5,908	244	4.1	8	0.1	5,625	807	14.6	112	2.0
1996	8.551	579	6.8	13	0.2	1,147	84	7.4	9	0.8
TOTAL	91,592	5,070	5.6	792	0.9	95,292	8,733	9.3	1,199	1.3

* Wild and hatchery steelhead are combined for 1985-86.

TABLE C-4. Yearling Chinook condition subsampling data from John Day Dam, 1985 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985	981	N/A	0.92	N/A	.9	N/A	0.00	N/A	N/A	N/A	10.19
1986	950	N/A	1.37	N/A	2.11	N/A	0.00	N/A	N/A	N/A	20.11
1987	1957	N/A	0.36	N/A	1.07	N/A	0.00	N/A	N/A	N/A	15.94
1988	1870	N/A	0.75	0.48	1.34	0.11	0.00	0.80	0.00	0.37	12.03
1989	1313	N/A	1.68	1.07	3.12	0.53	0.00	0.76	0.38	0.53	13.02
1990	1143	N/A	0.26	1.05	0.70	0.09	0.00	0.96	0.61	0.35	20.65
1991	1959	N/A	0.71	0.26	0.46	0.20	0.00	0.56	0.71	1.58	14.34
1992	1507	N/A	0.60	0.13	0.33	0.07	0.00	1.33	0.86	1.39	10.95
1993	3995	0.03	N/A	0.80	2.95	0.35	0.33	0.38	N/A	1.05	15.52
1994	3879	0.00	N/A	0.18	6.21	0.03	0.75	0.85	N/A	1.47	14.54
1995	2573	0.04	2.18	1.63	2.91	1.52	0.31	1.67	2.64	2.37	21.45
1996	2596	0.04	0.58	0.58	1.50	0.50	0.04	0.15	0.39	1.16	28.58

TABLE C-5. Subyearling Chinook condition subsampling data from John Day Dam, 1985 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985	2707	N/A	1.81	N/A	1 55	0.04	0.00	0.92	N/A	N/A	7.35
1986	3517	N/A	0.65	N/A	3.18	0.00	0.00	0.77	N/A	N/A	9.01
1987	4407	N/A	0.34	N/A	3.36	N/A	0.00	N/A	N/A	N/A	11.64
1988	4710	N/A	0.25	0.23	0.98	N/A	0.00	12.85	0.00	0.08	8.79
1989	2997	N/A	0.17	0.20	0.33	0.23	0.00	3.77	0.13	0.30	9.68
1990	2340	N/A	0.26	0.38	0.81	0.26	0.00	4.32	0.68	0.00	14.96
1991	3106	N/A	0.35	0.06	0.58	0.19	0.00	4.15	0.06	0.03	9.01
1992	2520	N/A	0.04	0.08	0.75	0.56	0.00	10.79	0.36	0.36	4.09
1993	5869	0.02	N/A	0.15	3.14	0.34	8.62	2.25	N/A	0.12	10.36
1994	4579	0.00	N/A	0.07	3.78	0.31	8.69	1.53	N/A	0.15	8.08
1995	4392	0.00	0.30	0.30	2.44	0.84	2.87	0.34	0.93	0 . 4 3	8.06
1996	3840	0.00	0.44	0.73	2.42	1.98	3.78	0.42	0.08	0.26	11.98

TABLE C-6. Coho condition subsampling data from John Day Dam, 1985 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-19% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985	96	N/A	2.08	N/A	2 08	N/A	0 00	N/A	N/A	N/A	7.29
1986	230	N/A	1.30	N/A	3.48	N/A	0.00	N/A	N/A	N/A	8.26
1987	750	N/A	0.13	N/A	0.93	N/A	0.00	N/A	N/A	N/A	11.87
1988	1080	N/A	0.09	0.00	0.28	0.09	0.00	0.46	0.00	0.37	5.93
1989	1159	N/A	0.09	0.26	1.04	0.17	0.00	0.17	0.00	0.69	6.47
1990	849	N/A	0.00	0.00	1.30	0.00	0.00	1.18	0.00	1.06	13.43
1991	844	N/A	0.00	0.24	0.36	0.12	0.00	0.12	0.12	0.47	14.34
1992	834	N/A	0.36	0.00	0.48	0.00	0.00	0.72	0.00	0.96	9.11
1993	2166	0.05	N/A	0.51	0.88	0.14	0.18	0.05	N/A	1.39	8.36
1994	1450	0.00	N/A	0.07	2.69	0.14	0.14	0.28	N/A	2.69	9.66
1995	1026	0.00	0.39	0.10	0.39	0.29	0.00	0.19	0.00	3.80	10.23
1996	1738	0.00	1.09	0.69	1.38	0.46	0.00	0.23	0.00	1.55	21.52

TABLE C-7. Wild Steelhead condition subsampling data from John Day Dam, 1990 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-1 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985											
1986											
1987											
1988											
1989											
1990	476	N/A	0.42	0.84	0.21	2.10	0.00	1.47	0.00	1.26	14.71
1991	899	N/A	0.44	1.00	0.67	7.45	0.00	0.00	0.33	1.67	7.56
1992	863	N/A	0.12	0.58	1.16	3.01	0.00	0.58	0.23	1.74	6.60
1993	2265	0.00	N/A	0.75	1.41	2.65	0.49	0.26	N/A	1.81	10.95
1994	1605	0.00	N/A	0.19	2.87	2.24	0.00	1.43	N/A	2.55	8.66
1995	1131	0.27	2.48	1.33	1.86	15.21	0.18	2.21	0.18	3.45	11.41
1996	1126	1.07	0.89	1.15	1.78	3.46	0.00	0.27	0.00	2.49	18.12

TABLE C-8. Hatchery Steelhead condition subsampling data from John Day Dam, 1985 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985	635	N/A	1.73	N/A	5.67	N/A	0.00	N/A	N/A	N/A	10.87
1986	1022	N/A	1.86	N/A	3.42	N/A	0.00	N/'A	N/A	N/A	21.33
1987	1603	N/A	0.75	N/A	2.87	N/A	0.00	N/A	N/A	N/A	13.79
1988	1758	N/A	1.54	0.85	3.47	1.59	0.00	1.99	0.00	1.37	12.34
1989	1391	N/A	0.93	1.51	5.18	3.67	0.00	2.73	0.00	3.45	13.59
1990	507	N/A	0.99	1.18	3.55	1.18	0.00	1.78	0.00	3.16	24.46
1991	1063	N/A	1.03	1.22	1.51	0.38	0.00	0.47	0.09	4.61	25.68
1992	938	N/A	0.32	1.71	3.62	0.32	0.00	2.99	0.00	6.08	14.61
1993	2371	0.46	N/A	3.58	5.65	0.89	0.55	1.98	N/A	6.45	36.95
1994	1812	0.00	N/A	1.88	9.93	0.06	0.06	3.92	N/A	15.07	24.17
1995	2243	0.04	4.55	6.55	4.90	7.13	0.13	4.50	0.13	15.07	30.58
1996	2185	0.46	2.24	2.24	4.30	0.64	0.09	0.96	0.00	9.61	41.05

TABLE C-9. Sockeye condition subsampling data from John Day Dam, 1985 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1985	553	N/A	0.8	N/A	0.18	N/A	0.00	N/A	N/A	N/A	9.40
1986	588	N/A	1.02	N/A	2.55	N/A	0.00	N/A	N/A	N/A	17.18
1987	740	N/A	0.41	N/A	0.81	N/A	0.00	N/A	N/A	N/A	17.30
1988	1004	N/A	0.20	0.40	0.10	0.00	0.00	0.40	0.00	0.00	6.08
1989	1013	N/A	0.59	0.59	0.39	0.00	0.00	0.39	0.20	0.00	10.37
1990	361	N/A	0.00	0.28	0.00	0.00	0.00	0.83	0.00	0.00	10.25
1991	549	N/A	1.46	0.91	0.18	0.00	0.00	0.18	0.18	0.55	9.47
1992	291	N/A	1.03	0.34	0.69	0.00	0.00	0.00	0.00	0.00	12.71
1993	1765	0.00	N/A	1.42	2.10	0.06	0.00	0.45	N/A	0.17	14.84
1994	1656	0.00	N/A	0.48	2.05	0.00	0.06	0.18	N/A	0.54	16.00
1995	1103	0.09	0.91	1.90	1.18	0.00	0.00	0.27	0.27	1.00	16.41
1996	399	0.50	0.00	1.25	0.25	0.25	0.00	0.25	0.00	0.50	20.30

Table C-10. Pit. tagrecaptures from John Day Dam, 1993 - 1996.
(Sample units indicated)

Species	Run	Rearing Type	1993 (3B & 3C)	1994 (3B)	1995 (3B)	1996 (3B & 3C)	TOTALS
Chinook	Spring	Hatchery	199	205	267	677	1348
		Wild	23	10	101	37	171
		Unknown					0
		Total	222		215	368	714	1519
	Summer	Hatchery	24	16	52	145	237
		Wild	4		20	40	64
		Unknown				1	1
		Total	28	16	72	186	302
	Fall	Hatchery	4	3	52	187	246
		Wild	9	4	13	10	36
		Unknown					0
		Total	13	7	65	197	282
	Unknown	Hatchery	44	19	915	795	1773
		Wild	17	4	253	182	456
		Unknown	15	14	28	215	272
		Total	76	37	1196	1192	2501
	Chinook Total		339	275	1701	2289	4604
Steelhead	Spring	Hatchery				5	5
	Summer	Hatchery	195	210	1068	1321	2794
		Wild	62	26	115	141	344
		Unknown				1	1
	Steelhead Total		257	236	1183	1468	3144
						5	5
Coho	Coho Total	Hatchery				5	5
sockeye	Spring	Hatchery	17		3		20
	Summer	Hatchery				8	8
		Wild		5	1		6
	Unknown	Hatchery				12	12
		Wild	19		9	2	30
	Sockeye Total		36	5	13	22	76
TOTALS (all detections combined)			**632**	**516**	**2897**	**3784**	**7829**

Table C-11. Brand recaptures at John Day Dam, 1985 - 1996.

Year	Yearling Chinook	Subyearlin Chinook	Wild Steelhead	Hatchery Steelhead	Coho	Sockeye	Total
1985	[illegible]	80	@	2,113	3	334	4,490
1986	6,08[illegible]	1,927	@	4,324	2	304	12,641
1987	1,890	1,024	@	1,608	4	107	4,631
1988	2,262	1,797	@	895	3	80	5,037
1989	2,207	1,585	@	2,150	1	36	5,979
1990	732	337	@	599	1	9	1,678
1991	576	773	@	1,134		85	2,568
1992*	1,420	945	66	546			2,977
1993*			24	1,463		39	4,515
1994	265	830		416			1,511
1995	1,[illegible]	1,[illegible]		183			1,060
1996	255	130		75	2		462
TOTALS =	19,280	11,665	90	15,506	16	994	47,551

@ Brands not differentiated between wild and hatchery steelhead in these years.

* Samples from gatewells 3B and 3C combined.

Table C-12. Adult salmonid fallbacks in gatewell 3B at John Day Dam, 1985 - 1996

Year	Chinook Adults	Jacks	Steelhead Wild	Steelhead Hatchery	Coho	Sockeye	Total
1985	28	85	?	50	1	12	176
1986	78	80	?	134	3	4	299
1987	25	4	?	58		1	88
1988	7	2	?	47	2		58
1989	18	7	?	80	1	22	128
1990	14	6	?	35		3	58
1991	10		?	34		6	50
1992	12		?	42	1	4	59
1993	12	2	?	145	1	a	168
1994	5	10	?	52	2	5	74
1995	11	12	40	71	1	2	137
1996	15	9	21	63		7	115
TOTAL	235	217	61	811	12	74	1410

? Fallbacks were not consistently differentiated as wild or hatchery prior to 1995.

Table C-13. The most numerous incidental species collected in unit 3B at John Day Dam, 1985 - 1996.

Year	American Shad		Pacific Lamprey		Crappie	Sculpin	Mountain
	Juvenile	Adult	Juvenile	Adult	Species	Species	Whitefish
985*	90,904	233	35	15	6 4	675	236
986	49,916	516	890	24	279	201	675
987	18,606	176	229	58	1,016	581	499
988	39,474	312	629	52	293	481	236
989	61,832	451	1,928	7	87	113	269
990**	330,177	213	923	4	96	48	253
991	168,602	179	9,337	44	99	59	383
992	203,782	175	178	6	38	4,827	444
993	180,088	615	4,348	7	58	256	582
994	111,418	460	3,250	28	28	479	353
995"	202,375	772	1,143	36	81	29	294
996^	56,245	657	481	10	8	23	303
TOTAL	1,513,419	4,759	23,371	291	8,257	7,772	4,527

tear	Sucker Species	Walleye	S-Mouth Bass	Blue-gill @	Squawfish	Peamouth	Chisel-mouth
1985*	571	161	789	18	89	24	195
1986	501	308	191	35	250	42	137
1987	372	677	283	22	63	27	86
1988	178	70	163	16	37	65	27
1989	222	101	74	14	53	108	40
1990""	92	24	60	1,054	17	25	25
1991	162	12	79	159	646	14	16
1992	64	813	119	44	9	32	14
1993	295	133	93	237	56	26	11
1994	234	167	68	8	16	104	25
1995^	142	84	115	102	41	200	34
1996"	137	28	38	27	18	28	14
TOTAL	2,970	2,578	2,072	1,736	1,295	695	624

* Unit 38 was out of service from April 2-26 for STS installations and testing in 1985.

** Sampling was done in Gatewell 5B during the 1990 season, and an electrical fire shut down the unit from 29 May to 10 June.

* 1995 and 1996 data are collection numbers expanded from actual sample numbers.

@ Bluegill and Pumpkinseeds are not differentiated.

Sample Seasons: (1985) 27 APR-29 OCT. (1986) 6 APR-26 OCT, (1987) 1 APR-30 NOV, (1988) 30 MAR-31 OCT, (1989) 28 MAR-31 OCT, (1990) 27 MAR-31 OCT, (1991) 7 APR-31 OCT, (1992) 25 MAR-13 OCT. (1993) 6 APR-29 OCT, (1994) 5 APR30 SEP, (1995) 6 APR-29 SEP, (1996) 9 APR-9 SEP.

APPENDIX D
HISTORICAL DATA

BONNEVILLE DAM

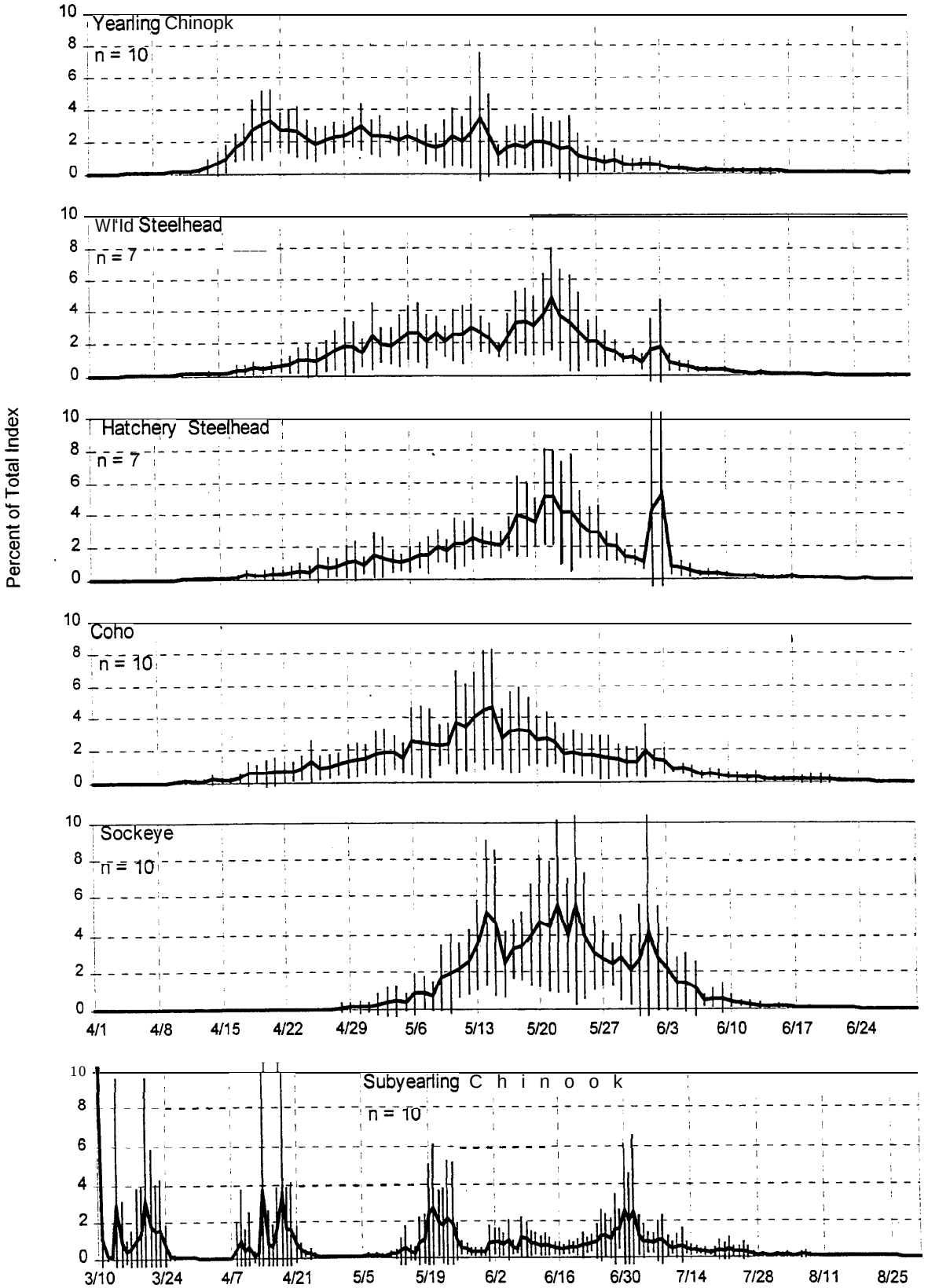


Figure D-l. Historical average passage pattern with standard deviation, Bonneville Dam, 1985 - 1996.

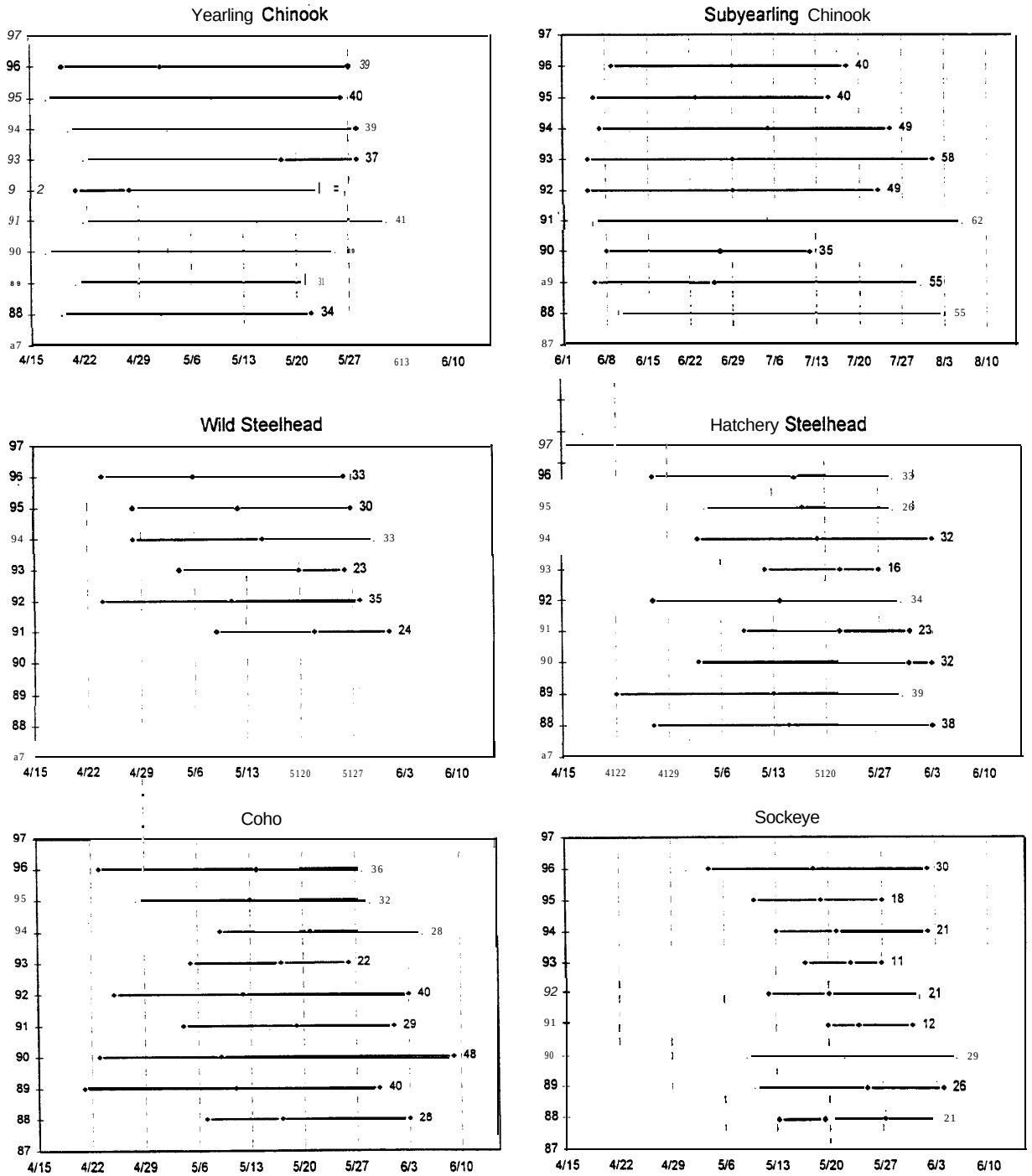


Figure D-2. 10%, 50%, and 90% passage dates for each season at Bonneville Dam, by species, 1987-1996. The duration between IO-90% dates (in days) is indicated above each line. Hatchery and wild steelhead were not differentiated before 1991.

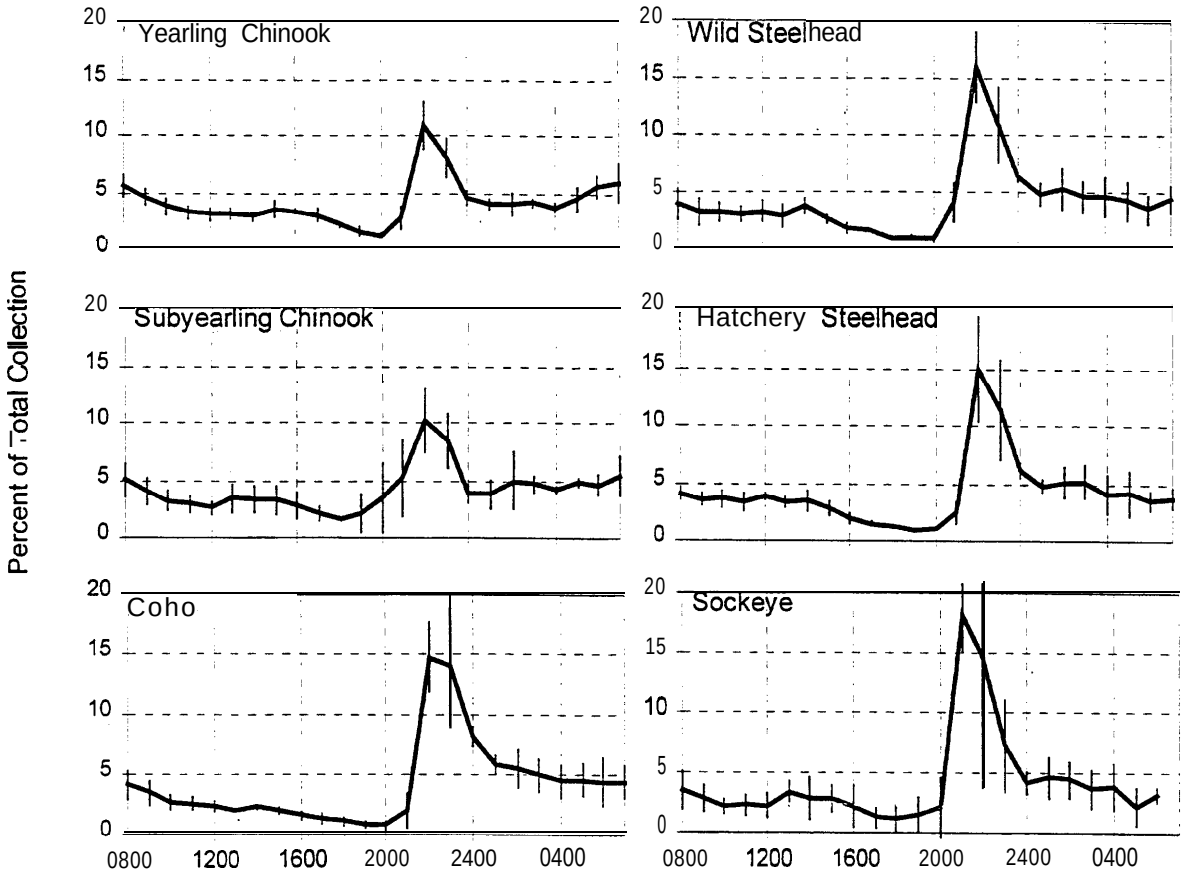


Figure D-3. Historical average diel passage with standard deviation, Bonneville Dam, 1992 - 1995.

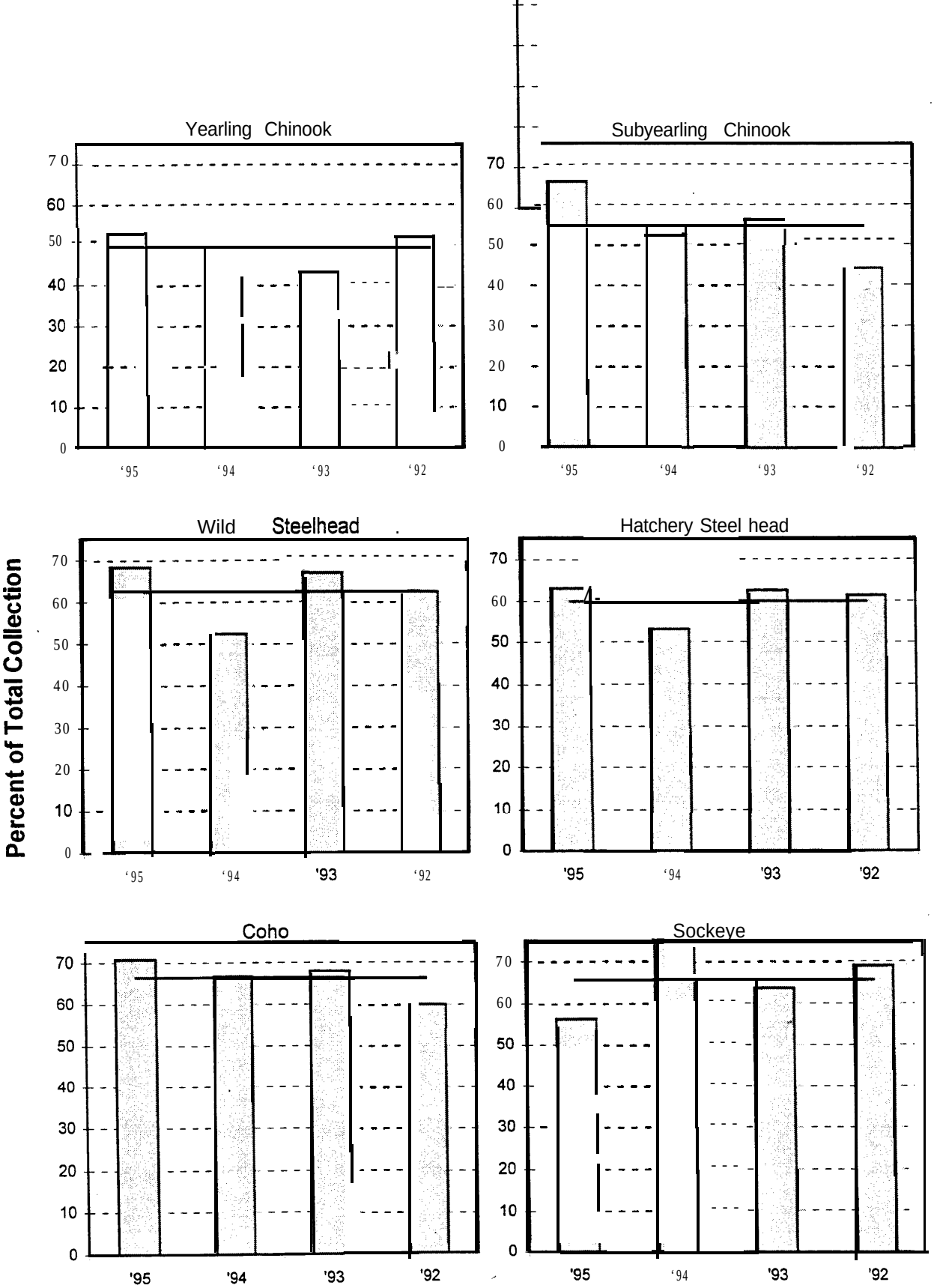


Figure D-4. Percent night passage (2000-0500) for each season of 24 hour monitoring at Bonneviile Dam, by species, including the average, 1992-1995.

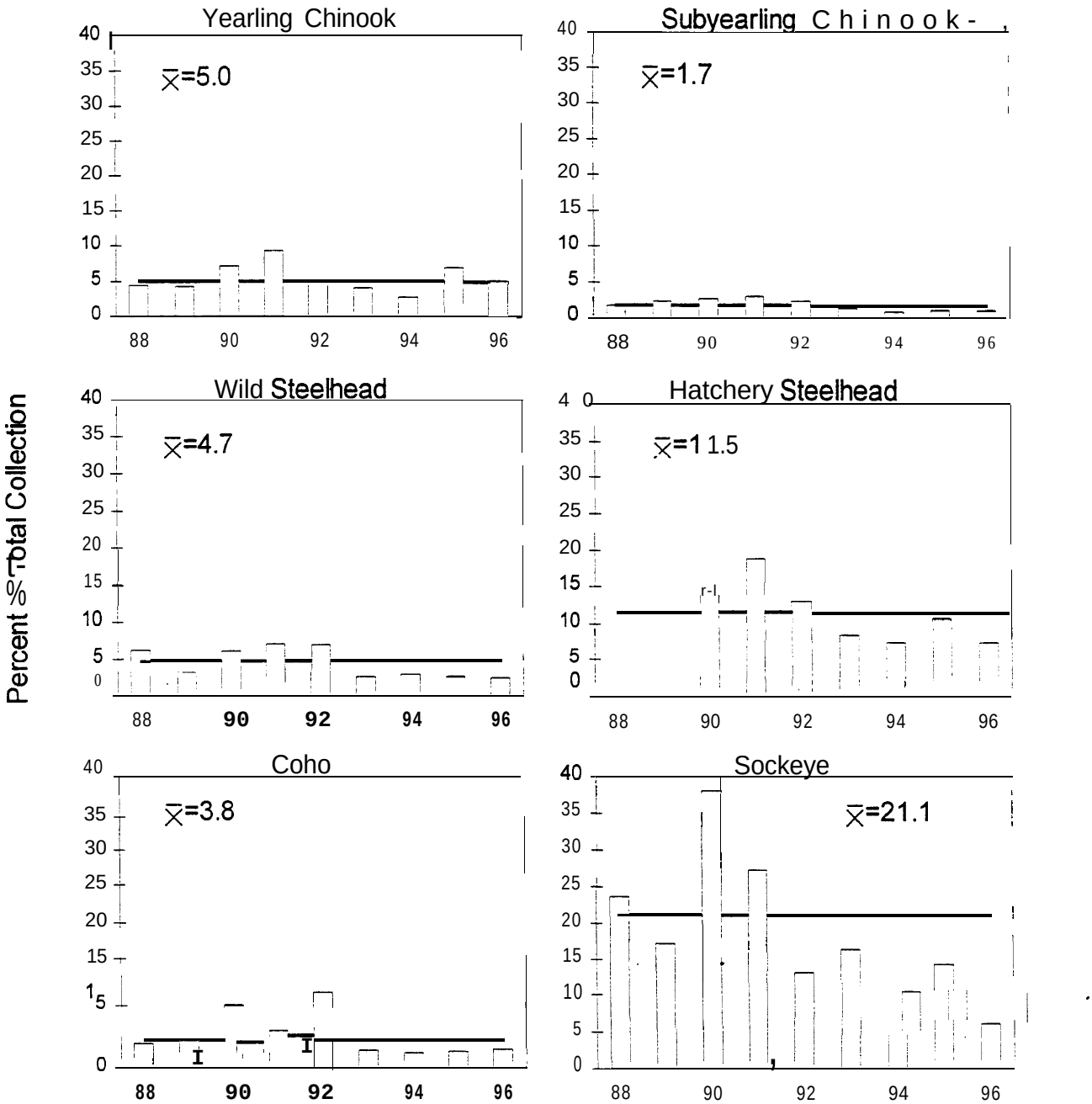


Figure D-5. Historical descaling percentages with the average at Bonneville Dam, 1988-1996. Hatchery and wild steelhead not differentiated before 1990.

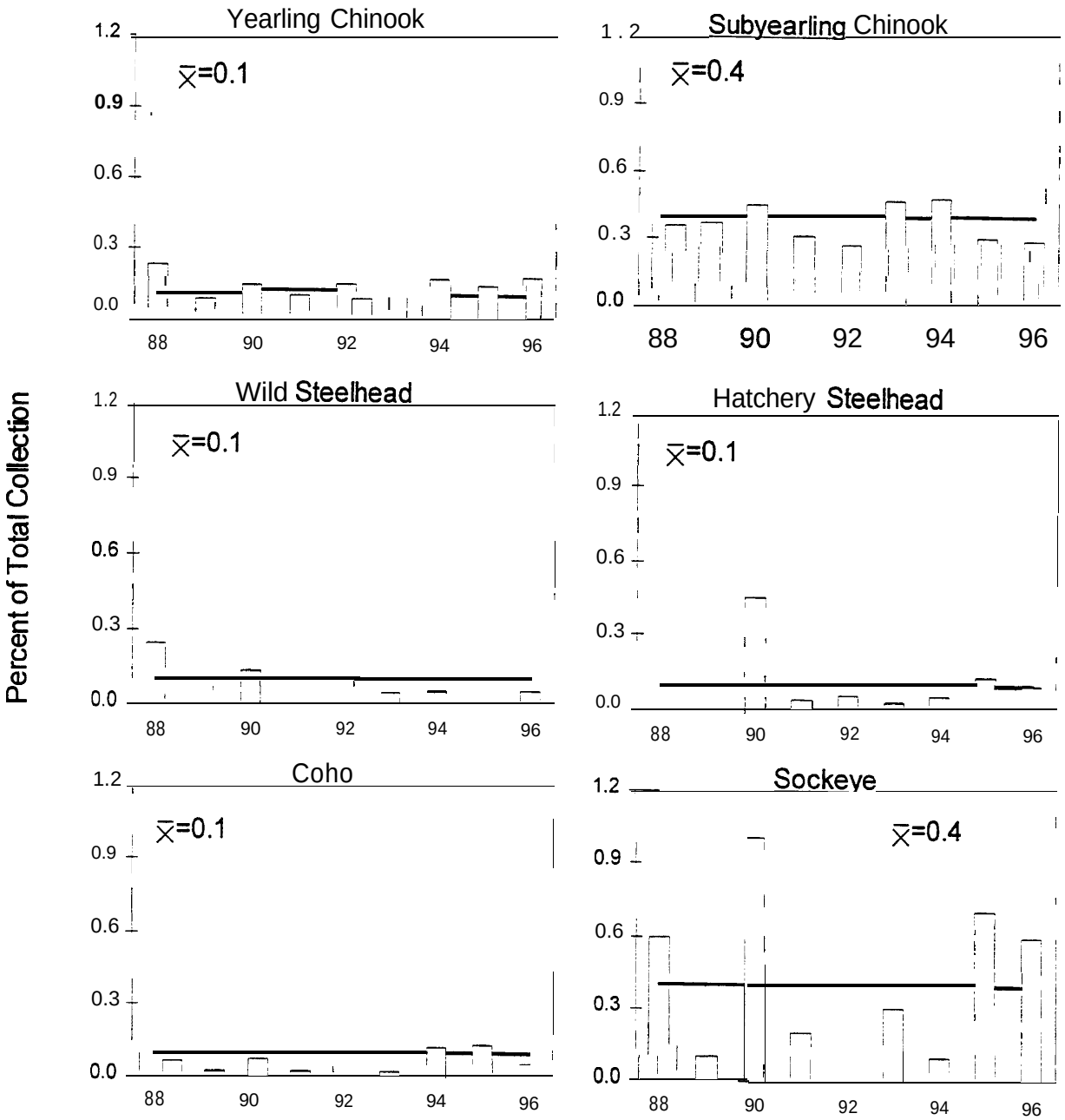


Figure D-6. Historical mortality percentages with the average at Bonneville Dam, 1988-1996. Hatchery and wild steelhead not differentiated before 1990.

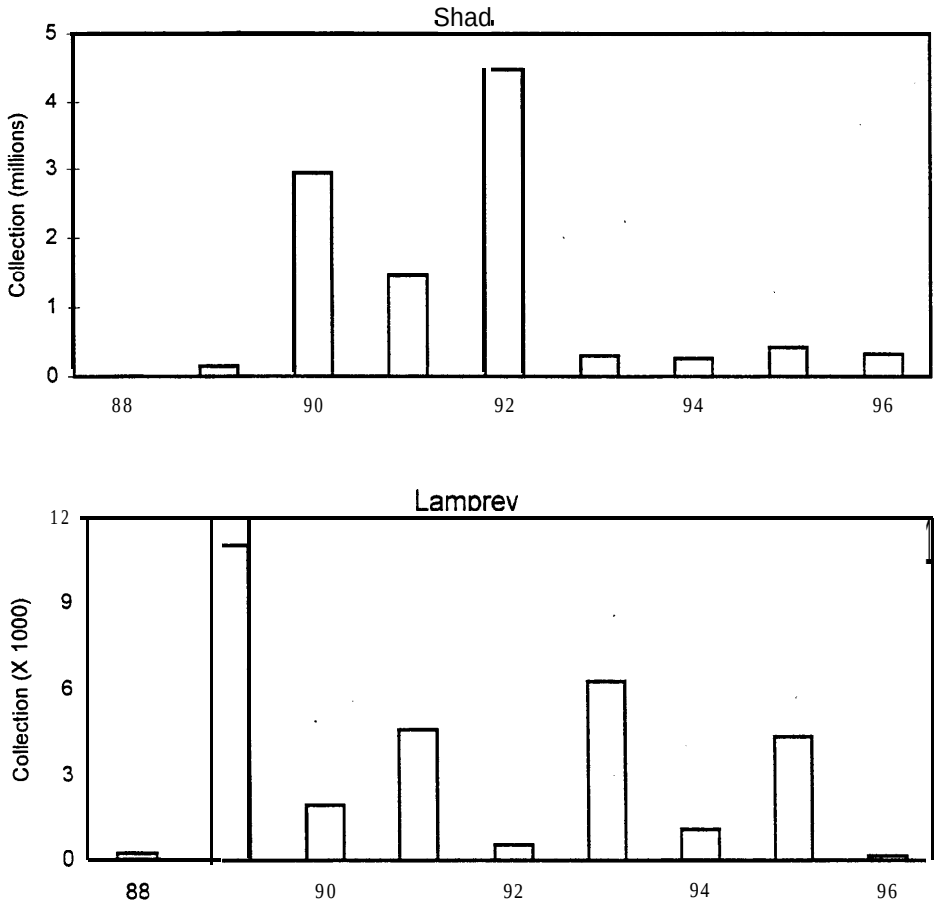


Figure D-7. Historical juvenile shad and lamprey counts at Bonneville Dam, 1988-1 996.

Table D-l. 10,50,and 90 percent passage dates at Bonneville Dam based on the RSDEP "daily" index.

Yearling Chinook

	10 %	50%	90 %	# of Days
1996	19-Apr	02-May	27-May	39
1995	17-Apr	09-May	26-May	40
1994	20-Apr	03-May	28-May	39
1993	22-Apr	18-May	28-May	37
1992	18-Apr	25-Apr	23-May	36
1991	22-Apr	15-May	01-Jun	41
1990	17-Apr	03-May	25-May	39
1989	21-Apr	06-May	21 -May	31
1988	19-Apr	02-May	22-May	34
1987	20-Apr	08-May	15-May	**
1986	12-May	22-May	30-May	**
MEDIAN	19-Apr	03-May	26-May	38
MIN	17-Apr	25-Apr	23-May	37
MAX	22-Apr	18-May	01-Jun	41
N =	9			

Subyearlrng Chrnook - "Brights" Only

	10 %	50%	90%'	# of Days
1996	9-Jun	29-Jun	18-Jul	40
1995	6-Jun	23-Jun	15-Jul	40
1994	07-Jun	05-Jul	25-Jul	49
1993	05-Jun	29-Jun	01-Aug	58
1992	05-Jun	29-Jun	23-Jul	49
1991	06-Jun	05-Jul	06-Aug	62
1990	08-Jun	27-Jun	12-Jul	35
1989	06-Jun	26-Jun	30-Jul	55
1988	IO-Jun	02-Jul	03-Aug	55
1987	03-Jun	30-Jun	02-Jul	**
1986	02-Jun	06-Jul	29-Oct	**
MEDIAN	06-Jun	29-Jun	2 5 - J	50
MIN	05-Jun	23-Jun	15-Jul	41
MAX	09-Jun	05-Jul	06-Aug	59
N =	9			

Wild Steelhead

	10 %	50%	90 %	# of Days
1996	24-Apr	6-May	26-May	33
1995	28-Apr	12-May	27-May	30
1994	28-Apr	15-May	30-May	33
1993	04-May	20-May	26-May	23
1992	24-Apr	11-May	28-May	35
1991	09-May	22-May	01-Jun	24
1990*				
1989*				
1988*				
1987*				**
1986*				**
MEDIAN	28-Apr	13-May	27-May	31
MIN	24-Apr	06-May	26-May	33
MAX	09-May	22-May	01-Jun	24
N =	6			

Hatchery Steelhead

	10 %	50%	90 %	# of Days
1996	27-Apr	16-May	29-May	33
1995	04-May	17-May	29-May	26
1994	03-May	19-May	03-Jun	32
1993	12-May	22-May	27-May	16
1992	27-Apr	14-May	30-May	34
1991	09-May	22-May	31-May	23
1990*	03-May	31-May	03-Jun	32
1989*	22-Apr	13-May	30-May	39
1988*	27-Apr	15-May	03-Jun	38
1987*	01-May	12-May	01-Jun	**
1986*	19-May	27-May	02-Jun	**
MEDIAN	03-May	17-May	30-May	28
MIN	27-Apr	14-May	27-May	31
MAX	12-May	22-May	03-Jun	23
N =	9			

Coho

	10 %	50%	90 %	# of Days
1996	23-Apr	14-May	28-May	36
1995	28-Apr	13-May	29-May	32
1994	09-May	21 -May	05-Jun	28
1993	05-May	17-May	26-May	22
1992	25-Apr	12-May	03-Jun	40
1991	04-May	19-May	01-Jun	29
1990	23-Apr	09-May	09-Jun	48
1989	21-Apr	11-May	30-May	40
1988	07-May	17-May	03-Jun	28
1987	06-May	12-May	01-Jun	**
1986	21-May	28-May	04-Jun	**
MEDIAN	28-Apr	14-May	01-Jun	35
MIN	23-Apr	12-May	26-May	34
MAX	09-May	21 -May	05-Jun	28
N =	9			

Sockeye

	10 %	50%	90 %	# of Days
1996	4-May	18-May	2-Jun	30
1995	1 O-May	19-May	27-May	18
1994	13-May	21-May	2-Jun	21
1993	17-May	23-May	27-May	11
1992	12-May	20-May	1-Jun	21
1991	20-May	24-May	31 -May	12
1990	9-May	22-May	6-Jun	29
1989	1 O-May	25-May	4-Jun	26
1988	14-May	20-May	3-Jun	21
1987	13-May	01-Jun	05-Jun	**
1986	19-May	28-May	02-Jun	**
MEDIAN	12-May	21 -May	02-Jun	22
MIN	04-May	18-May	27-May	24
MAX	20-May	24-May	02-Jun	14
N =	9			

* Years in which no differentiation was made between wild and hatchery steelhead for index purposes.
** 1986 and 1987 data not included; the PHI sampler was operating for testing only.

Table D-2. Percent night passage (2000-0500) for 1992-95 at Bonneville Dam.

YEAR	Yearling Chinook	Subyearling Chinook	Wild Steelhead	Hatchery Steelhead	Coho	Sockeye
'95	52.8	65.8	68.3	62.9	70.7	56.2
'94	49.6	52.4	52.2	53.1	66.7	74.6
'93	43.2	56.2	67.1	62.4	68.1	63.6
'92	52.0	44.0	62.3	61.3	60.0	69.0
MEDIAN	50.8	54.3	64.7	61.9	67.4	66.3
MIN	43.2	44.0	52.2	53.1	60.0	56.2
MAX	52.8	65.8	68.3	62.9	70.7	74.6

TABLE D-3. Descaling and mortality data from Bonneville Dam, PH1 , 1988 - 1995.

CHINOOK 1						CHINOOK 0				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SMPLD	DESC	%DESC	MORT	%MORT
1988	28,958	1,265	4.4	67	0.2	96,415	1,659	1.7	337	0.4
1989	27,934	1.164	4.2	22	0.1	98,571	2,119	2.2	361	0.4
1990	23,821	1,675	7.0	34	0.1	80,446	1,956	2.4	358	0.5
1991	29,409	2.741	9.3	24	0.1	83,240	2,383	2.9	257	0.3
1992	42,523	1,952	4.6	62	0.2	112,037	2,517	2.3	301	0.3
1993	52,623	2,050	3.9	51	0.1	130,615	1,557	1.2	611	0.5
1994	34.36 1	896	2.6	58	0.2	125,967	999	0.8	600	0.5
1995	19,557	1,310	6.7	27	0.1	60,356	651	1.1	la9	0.3
1996	7,246	370	5.1	13	0.2	27,113	254	0.9	a2	0.3
otal										
88-96	266,432	13,423	5.0	358	0.1	814,760	14,095	1.7	3,096	0.4

WILD STEELHEAD						HATCHERY STEELHEAD				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SMPLD	DESC	%DESC	MORT	%MORT
1988	7.478	452	6.1	la	0.2					
1989	12,240	536	4.4	13	0.1					
1990	3,894	232	6.0	5	0.1	5,521	818	14.9	25	0.5
1991	2,772	194	7.0	0	0.0	5,502	1,036	18.8	4	0.1
1992	2,837	194	6.8	3	0.1	3,767	487	12.9	2	0.1
1993	4,025	96	2.4	2	0.0	7,456	622	a.3	2	0.0
1994	3,730	102	2.7	2	0.1	3,981	290	7.3	2	0.1
1995	1,240	.32	2.6	0	0.0	3,737	397	10.6	5	0.1
1996	1,821	44	2.4	1	0.1	5,075	369	7.3	5	0.1
otal										
88-96	40,037	1,882	4.7	44	0.1	35,039	4,019	11.5	45	0.1

COHO						SOCKEYE				
DATE	SMPLD	DESC	%DESC	MORT	%MORT	SMPLD	DESC	%DESC	MORT	%MORT
1988	40,776	1,340	3.3	24	0.1	4,588	1,077	23.6	28	0.6
1989	29,747	998	3.4	5	0.0	7,723	1,319	17.1	11	0.1
1990	43,032	2,325	5.4	30	0.1	4,537	1,710	38.1	45	1.0
1991	23,842	1,059	4.4	5	0.0	4,462	1,205	27.1	9	0.2
1992	23,971	1,485	6.2	24	0.1	638	83	13	0	0.0
1993	28,243	649	2.3	6	0.0	4,939	803	16.3	15	0.3
1994	22,378	430	1.9	27	0.1	2,965	322	10.9	2	0.1
1995	11,868	258	2.2	16	0.1	2,184	305	14.1	15	0.7
1996	12,689	320	2.5	8	0.1	694	43	6.2	4	0.6
Total										
88-96	236,546	8,864	3.8	145	0.1	32,730	6,867	21.1	129	0.4

1 Wild and hatchery steelhead numbers are combined for 1988-89.

TABLE D-4. Descaling and mortality data from Bonneville Dam, PH-2, 1988 - 1996.

CHINOOK 1						CHINOOK 0				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1988	7,076	361	5.2	147	2.1	9,711	185	2.0	390	4.0
1989	15,579	671	4.4	478	3.1	12.144	74	0.6	176	1.5
1990	5,267	278	5.3	36	0.7	2,669	8	0.3	10	0.4
1991	17,943	1,780	10.0	143	0.8	7,846	140	1.8	39	0.5
1992	358	36	10.2	5	1.4	1,452	42	2.9	6	0.4
1993	5,468	393	7.2	36	0.7	5,545	65	1.2	36	0.7
1994	4,172	208	5.1	54	1.3	5,703	80	1.4	138	2.4
1995	2,709	180	6.7	16	0.6	4,696	108	2.3	31	0.7
1996	3,059	304	10.0	16	0.5	8,662	176	2.0	29	0.3
TOTAL	61,631	4,211	6.9	931	1.5	58,428	878	1.5	855	1.5

WILD STEELHEAD						HATCHERY STEELHEAD				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1988	762	43	5.7	12	1.6					
1989	2,049	84	4.2	31	1.5					
1990	206	5	2.5	4	1.9	176	25	15.6	16	9.1
1991	921	88	9.6	6	0.7	1,614	321	20.1	17	1.1
1992	3	0	0.0	0	0.0	4	0	0.0	0	0.0
1993	255	16	6.3	0	0.0	462	79	17.1	1	0.2
1994	279	31	11.2	1	0.4	218	5	2.3	2	0.9
1995	65	4	6.3	1	1.5	184	35	19.1	1	0.5
1996	182	1	0.6	1	0.5	531	48	9.1	1	0.2
TOTAL	4,722	272	5.8	56	1.2	3.189	513	16.3	38	1.2

COHO						SOCKEYE				
YEAR	SAMPLED	DESC	%DESC	MORT	%MORT	SAMPLED	DESC	%DESC	MORT	%MORT
1988	5,556	195	3.6	61	1.1	237	33	16.4	36	15.2
1989	9,192	282	3.1	207	2.3	2,247	343	19.1	451	20.1
1990	5,498	204	3.7	16	0.3	137	25	18.5	2	1.5
1991	7,284	448	6.2	33	0.5	2,575	761	30.3	61	2.4
1992	119	9	7.6	1	0.8	1	1	100	0	0.0
1993	3,621	162	4.5	7	0.2	623	126	20.4	4	0.6
1994	2,678	69	2.6	18	0.7	400	75	18.9	4	I.C
1995	1,075	29	2.7	5	0.5	348	61	18	9	2.6
1996	4,296	113	2.6	18	0.4	196	33	17.2	4	2.c
TOTAL	39.319	1,511	3.9	366	0.9	6,764	1,458	23.5	571	8.4

* Wild and hatchery steelhead numbers are combined for 1988-89.

TABLE D-5. Yearling Chinook condition subsampling data from Bonneville Dam, 1988 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-19% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988	1856	N/A	0.2/	0.05	0.59	0.05	N/A	0 11	0 00	0.16	4.20
1989	2327	N/A	0.39	0.39	1.12	0.21	N/A	0.34	0.17	0.43	8.04
1990	3111	N/A	0.10	0.13	0.84	0.13	N/A	0.51	0.23	0.58	9.64
1991	2158	N/A	0.42	0.32	0.65	0.00	N/A	0.23	0.23	0.42	5.38
1992	2190	N/A	0.41	0.23	0.73	0.27	N/A	0.37	0.87	0.50	6.39
1993	2934	0.17	0.00	0.65	3.03	0.55	N/A	0.85	0.00	0.55	14.25
1994	4018	0.00	0.00	0.37	1.84	0.20	N/A	0.77	0.00	1.14	9.98
1995	2648	0.11	1.44	1.36	4.80	0.98	N/A	0.87	1.13	0.98	14.31
1996	2305	0.00	0.52	0.56	1.52	0.22	0.00	0.48	0.43	1.13	12.75

TABLE D-6. Subyearling Chinook condition subsampling data from Bonneville Dam, 1988 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988	3451	N/A	0.09	0.03	0.67	0.03	N/A	0.09	0.00	0.12	2.98
1989	8481	N/A	0.15	0.09	1.29	0.15	N/A	0.05	0.12	0.04	4.55
1990	6929	N/A	0.10	0.14	0.64	0.16	N/A	0.07	0.32	0.27	1.93
1991	4404	N/A	0.23	0.11	0.43	0.30	N/A	0.05	0.52	0.09	2.45
1992	4422	N/A	0.09	0.25	0.34	0.41	N/A	0.05	0.79	0.47	3.55
1993	8343	0.01	0.00	0.36	3.12	0.31	N/A	0.08	0.00	0.11	7.76
1994	7149	0.00	0.00	0.29	0.92	0.10	N/A	0.10	0.00	0.08	4.00
1995	5230	0.00	0.33	0.44	1.97	0.23	N/A	0.13	0.17	0.13	5.35
1996	4080	0.00	0.32	0.47	0.69	0.12	0.00	0.17	0.05	0.22	4.56

TABLE D-7. Coho condition subsampling data from Bonneville Dam, 1988 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-I 9% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988	2148	N/A	0.09	0.05	0.28	0.05	N/A	0.61	0.00	0.05	3.17
1989	2626	N/A	0.42	0.23	0.42	0.19	N/A	0.30	0.00	0.19	6.28
1990	3468	N/A	0.09	0.09	0.43	0.09	N/A	0.40	0.06	0.46	7.73
1991	1967	N/A	0.20	0.20	0.36	0.20	N/A	0.15	0.10	0.31	1.83
1992	1883	N/A	0.27	0.37	0.32	0.16	N/A	0.64	0.00	0.32	5.47
1993	2227	0.09	0.00	0.45	1.93	0.27	N/A	0.90	0.00	0.31	5.34
1994	2725	0.00	0.00	0.22	1.10	0.11	N/A	1.10	0.00	0.33	6.68
1995	2574	0.04	0.62	0.35	3.11	0.85	N/A	1.09	0.12	0.47	7.58
1996	2720	0.00	0.18	0.18	0.55	0.18	0.11	0.37	0.04	1.03	10.22

TABLE D-8. Wild Steelhead condition subsampling data from Bonneville Dam, 1990 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-19% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988											
1989											
1990	1042	N/A	0.38	0.19	1.44	4.03	N/A	1.25	0.00	2.11	10.08
1991	706	N/A	0.85	0.71	1.56	8.22	N/A	0.71	0.00	1.56	2.55
1992	590	N/A	0.17	0.17	0.68	5.59	N/A	0.34	0.00	2.20	5.59
1993	1250	1.92	0.00	0.24	1.60	6.64	N/A	0.72	0.00	5.84	6.56
1994	1429	0.49	0.00	0.49	2.59	8.33	N/A	0.49	0.00	2.80	9.24
1995	419	0.24	1.67	1.19	2.86	19.33	N/A	0.24	0.00	3.10	9.79
1996	789	0.51	0.25	0.63	0.38	8.11	0.00	0.25	0.00	1.52	9.00

TABLE D-9. Hatchery Steelhead condition subsampling data from Bonneville Dam, 1988 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-19% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988	1403	N/A	0.78	0.29	.0.78	1.50	0.50	0.00	0.00	3.85	7.48
1989	2319	N/A	0.43	0.73	1.21	3.32	N/A	1.03	0.04	2.50	10.48
1990	1366	N/A	0.88	0.73	1.46	0.15	N/A	3.07	0.00	6.15	21.52
1991	1024	N/A	0.29	4.39	0.88	0.20	N/A	0.78	0.20	3.81	9.67
1992	735	N/A	0.41	2.99	1.09	0.41	N/A	1.22	0.00	4.76	11.02
1993	1669	0.78	0.00	1.86	3.18	2.22	N/A	1.44	0.00	0.00	16.12
1994	1595	0.06	0.00	3.13	3.64	0.94	N/A	0.56	0.00	8.40	21.63
1995	1278	0.00	1.88	3.36	5.71	2.11	N/A	3.05	0.08	8.29	25.67
1996	1789	0.00	0.28	3.47	2.12	0.11	0.00	0.78	0.06	10.01	27.56

TABLE D-10. Sockeye condition subsampling data from Bonneville Dam, 1988 - 1996.

YEAR	NO. SMPLD	GBT	INJURY			DISEASE				BIRD PRED	3-19% DESC
			HEAD	OPERC	BODY	PAR.	COL.	FUN.	BKD		
1988	686	N/A	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	9.62
1989	1397	N/A	0.50	0.50	0.36	0.00	N/A	0.07	0.07	0.07	16.11
1990	1425	N/A	1.26	0.77	0.49	0.07	N/A	0.14	0.07	0.14	14.88
1991	621	N/A	0.97	2.25	0.81	0.00	N/A	0.32	0.00	0.32	11.27
1992	131	N/A	0.76	2.29	0.76	0.00	N/A	0.00	0.00	0.00	17.56
1993	940	0.00	0.11	2.34	3.09	0.32	N/A	0.43	0.00	0.21	23.83
1994	1047	0.00	0.00	1.91	1.43	0.00	N/A	0.29	0.0	19	26.65
1995	829	0.00	0.97	2.41	1.09	0.00	N/A	0.72	0.00	0.24	23.88
1996	307	0.00	0.00	1.30	1.63	0.33	0.00	0.00	0.00	0.00	13.36

Table D-I 1. Pit Tag recaptures from Bonneville Dam, 1992 - 1996.
(Sample units indicated)

Species	Run	Keanng Type	1992 PHI	1993 PHI	1994 PHI	1995 PHI	1996 PH1+FPD	TOTALS
Chinook	Spring	Hatchery	1	10	48	38	831	988
		Wild	1	13	5	13	60	92
		Unknown	4					4
		Total	6	83	53	51	891	1084
	Summer	Hatchery		6	6	9	273	294
		Wild		1	2	5	43	51
		Unknown						0
		Total		7	8	14	316	345
	Fall	Hatchery		1		20	140	161
		Wild		2	3	2	2	9
		Unknown	2					2
		Total	2	3	3	22	142	172
	Unknown	Hatchery	4	15	7	131	1057	1214
		Wild		6	2	60	180	248
		Unknown	5	9	4	2	223	243
		Total	9	30	13	193	1460	1705
	Chinook total		17	123	77	280	2809	3306
Steelhead	Spnng	Hatchery					18	18
	Summer	Hatchery		16	19	46	1454	1535
		Wild		5	4	3	200	212
		Unknown		1			2	3
	Steel head	otal	0	22	23	49	1674	1768
Coho	Fall	Hatchery					13	15
	Coho Total						13	13
Sockeye	Spring	Hatchery		6				6
	Summer	Hatchery					11	11
		Wild					2	2
	Unknown	Hatchery	2		1		23	26
		Wild		4	4	1	16	25
	Sockeye	otal	2	10	5	1	52	70
TOTALS (all detections combined)			25	**155**	**105**	330	4546	5163

FPD = flat plate detector in PHI

Table D-12. Brand recaptures at Bonneville Dam PH-1, 1988 - 1996.

Year	Yearling Chinook	Subyearlin Chinook	Wild Steelhead	Hatchery Steelhead	Coho	Sockeye	Total
1988	425	165	@	157	7	55	804
1990	886	369	@	443		16	1,344
			@	218		6	699
1991	258	235	@	204	2	48	747
1992	220	212	18	40			490
1993	349	360	6	57		19	791
1994	55	187		27			269
1995	181	147		77			405
1996	91	56		63	1		211
TOTALS =	2,386	1,915	24	1,286	5	144	5,760

@ Brands not differentiated between wild and hatchery steelhead in these years.

Table D-I 3. Adult salmonid fallbacks captured at PH-1, Bonneville, Dam, 1988-l 996.

Year	Chinook	Steelhead	Coho	Sockeye	otal
1988	1	1			2
1989	4	1	1	1	7
1990	1				1
1991	3	5		7	15
1992	1				1
1993	4				4
1994	2	1			3
1995	1	6			7
1996	1	3		1	5
TOTAL	18	17	1	9	45

Table D-14. The most numerous incidental species collected at PH-1, Bonneville Dam, 1988 - 1996.

Year	American Shad		Pacific Lamprey	
	Juvenile	Adult	Juvenile	Adult
1988*	2,36	17	204	37
1989*	435,653	39	34,756	63
1990*	2,939,363	0	1,909	0
1991"	1,454,524	8	4,567	4
1992^	4,479,820	46	531	86
1993^	288,463	148	6,269	78
1994^	252,474	85	1,074	47
1995^	414,487	1,130	4,329	213
1996"	318,190	104	146	60
TOTAL	10,585,335	1,577	53,785	588

Year	Stickleback	Peamouth	Squawfish	Redside Shiner	S-Mouth Bass	Sculpin Species	Mountain Whitefish
1988"	2,017	1,47754	243 698	264 384	228	1738	33
1989*							34
1990*	4,527	224	520	56	88	47	58
1991*	1,862	849	889	224	31	12	121
1992"	6,581	1,053	672	67	162	136	41
1993"	6,583	1,603	264	377	251	268	75
1994"	78,799	4,669	311	269	122	56	65
1995"	5,931	2,227	979	677	567	233	665
1996*	88	823	21	259	59	60	73
TOTAL	107,861	13,615	4,597	2,577	1,513	1,182	1,165

* Collection estimates based on 8 hour (1600-2400) sample periods.

^ Collection estimates based on 24 hour (0800-0700) sample periods.

Table D-15. Sample and collection numbers of chinook and coho fry at Bonneville Dam, PH 1, 1992-96.

YEAR	Number Sampled		Number Collected	
	Chinook	Coho	Chinook	Coho
1992	2,742		15,165	
1993	5,659		61,457	
1994	1,538	72	14,731	459
1995	1,917	156	30,440	1,389
1996	79	9	647	97
TOTAL	11,935	237	122,440	1,945